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The Welding Engineer

Reg. U. S. Pat. Office

ume 20 April, 1935 Number 4

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neer Business and Technical Journal of the Welding Industry

CHANGING DESIGN *AT LOW COST*

● Here's a case where a manufacturer has discovered the advantages and economies of rolled steel in machine construction. A stator frame is being welded up from rolled steel. Notice the cleanness and simplicity of design. Every pound of metal counts; there is no waste weight.

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THE WELDING ENGINEER

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Published on the 15th of each month by The Welding Engineer Publishing Company, 608 S. Dearborn St., Chicago, Ill. Telephone Webster 7134.

G. H. Mackenzie, *President and Treasurer* — F. L. Spangler, *Editor* — L. C. Monroe, *Advertising Manager*

REPRESENTATIVES

EASTERN: T. E. Depew, American Circle Bldg., New York, N. Y. Tel. Columbus 5-7843.
PACIFIC COAST: W. R. McIntyre, 1115 Tyler St., Glendale, Calif.

Subscription, payable in advance: United States and possessions, $3 a year; Foreign Countries, $4 a year; Canada, $4 a year; Single copy, domestic, 25 cents; Single copy, foreign, 35 cents. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

FOREIGN REPRESENTATIVES: GREAT BRITAIN—Capt. D. Richardson, 26 Winterbrook Road, Herne Hill, London; AUSTRALIA and NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand; SOUTH AFRICA—J. W. Arnison, 35a Victoria Avenue, Benoni, Transvaal, South Africa.

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· E D I T O R I A L ·

The Railroads Show Some Smart Improvements

● Whether it be due to competition from other modes of land and air travel, or it be merely an expression of a voluntary desire on the part of railroad management and engineering staffs to better the service and reduce costs, the fact is that the steam railroads of this country are passing through a period of technological development that is more farflung in its manifestations and possibilities than anything of like nature ever experienced in our history. Whatever the causes of such enlightenment on the part of our great transportation systems, these are, for the moment, less important than the fact that such enlightenment really exists. With long non-stop runs of streamlined, Diesel-powered trains, bulk-cargo cars of low tare weight and high capacity, made possible by the new high-strength steels, and an increasing demand for long stretches of jointless rails, the railroads have challenged the old idea that their intelligence quota is a big, round zero. ¶ The automobile industry has always been held up to American business as the model in the use of advanced ideas in construction and design. But now it looks as if the automobile's older cousin, the railroad, will be in a position before long to bid for first place in the application of advanced engineering thought. ¶ Much of this engineering progress would have been impossible without the welding processes. Diesel-engine weights of 15 lb. per horsepower can be realized only with carefully designed frames and crankcases of welded construction. Of what practical good is streamlining, if the surface is broken up by unsightly wart-like rivet heads? Welding allows the making of a true stream-lined shell of pleasing contour. Rivets are passe, except where alloys are used that will be damaged by the welding heat. One of the reasons for the increasing popularity of high-strength, corrosion-resistant low-alloy steels is the possibilities of great weight reduction. But the opportunities in this direction can be fully realized only with welded construction, since welding eliminates connection angles and lapped seams and allows all plates and members to develop their full sections. ¶But progress is not limited to rolling stock. For years some of the steam roads have seriously tackled the problem of rail-end wear by building up the ends and following with heat-treatment. But now the jointless rail has been shown to be entirely feasible, in view of recent results obtained with long stretches of jointless track in this country and Europe. Stretches of rail on mainline tracks, with all joints welded, making a continuous, unbroken rail more than a half mile long, have passed through two winters without any signs of movement or fracture. Calculation of stresses between hot summer days and winter cold bears out the claim that if the rails are well anchored to the ties and the track is well ballasted, especially at the ends of the ties, the jointless rail is thoroughly practicable. ¶ The railroads are going after much of the passenger traffic they have lost in the last fifteen years. Jointless rails will make for comfortable, quiet travel. Stream-lined, high-speed trains will help to realize more frequent and faster service. Diesel power will very materially reduce operating costs. All in all, it looks as if with the aid of welding, the steam roads may realize their ambition.

Welding and Cutting Puts a Crimp in Standardization

● It wasn't so long ago that almost all resistance-welding machines were built to standard designs and sold as standardized products. Today the condition is quite different—about 90 per cent of such equipment is being built special to meet the specific requirements of the buyer, since these requirements are probably quite different from those of any other user of such equipment. This change from standard to special equipment is also noticeable in the case of many other types of machines. Certain manufacturers of punch presses and press brakes have for several years depended largely on orders for special machines to keep their employees on the payroll. Because of the application of welding and flame cutting, the change from standard equipment and standard parts to special equipment has not been as disturbing as one might expect. One manufacturer of presses has claimed for several years that he can furnish "custom-built" equipment on short order and at prices much in line with those of standard machines. With the cutting torch and the welding arc, plates are cut to shape and welded to form the machine, and pattern costs for castings are eliminated. Hence, these modern cutting and welding tools have made possible the lowering of costs on special machines to the point where in many cases their cost in terms of cents per pound of steel entering their construction is no higher than that of the standard machine. Thanks to the welding and cutting processes, individuality in machines and heavy equipment need not be sacrificed to the god of standardization.

"I Cover the WELDING Front

...and join up as a member of the tank corps!"

JUST about the time you figure you'll get a little work done on the garden, along comes a hurry-up call from some shop that isn't thinking of anything except welding.

So a few days ago when I'm trying to decide shall I get bone meal or sheep manure, and how much, I suddenly finds myself in Jersey on a tank job.

This tank is 12' x 6' x 5', made of ¼" Nickel-clad Steel, 10 per cent cladding. It's a dye tub for one of those Jersey textile plants. As you look at it, it seems to be an easy enough job. The man who's building it is a boiler maker, and a good scout. And after the welder and I get down to putting the tank together he begins telling me about the trouble he is having with his rambler roses.

Now ramblers can give you something to worry about, I tells him. It aint like this job. We just tack the whole tank together with steel welding rod and then completely finish the steel side. Unless you have a good clay soil, I tells him, any roses are likely to up and die on you.

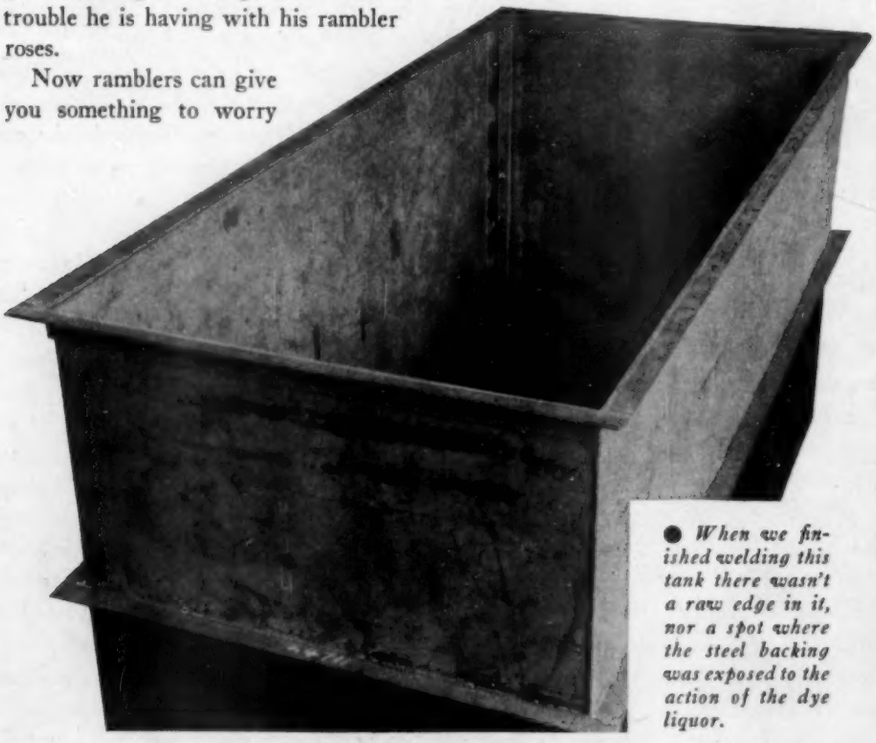
On the Nickel side of the tank we have to make sure that every inch of the steel is covered, and in particular at the seams. So I laid a single fillet in the corners with a ⅛" No. 31 Nickel metallic arc welding rod. Just one neat Nickel bead in each corner gives a continuous Nickel inside surface.

There, I show him, is that part of the job done, but now how about the top? Can't risk having the exposed steel edge rust which would play hob with the dye inside the tank. It's as bad I told him as mealy bug.

He had planned to cover the edge with a Nickel-clad angle, which worked fine. We welded it with the same No. 31 wire we used on the rest of the job and finished up by welding two pure Nickel vertical angles inside the tank so a partition might be bolted to it. As I'm leaving he tells me he finds nicotine spray works fine for mealy bug.

With best wishes,

Nick Rodder
INCO WELDING SERVICE



● *When we finished welding this tank there wasn't a raw edge in it, nor a spot where the steel backing was exposed to the action of the dye liquor.*

INCO WELDING RODS and FLUXES

for **PURE NICKEL**

Oxy-Acetylene... No. 41 Nickel Gas Welding Wire.
Metallic Arc... INCO Nickel Metallic Arc Welding Wire No. 31.
Carbon Arc... INCO Nickel Carbon Arc Welding Wire No. 21.

for **MONEL METAL**

Oxy-Acetylene... No. 40 Monel Gas Welding Wire. For flux see *below.
Oxy-Acetylene... No. 43 Silicon Monel Gas Welding Wire.
Metallic Arc... INCO Monel Metal Arc Welding Wire No. 30.
Carbon Arc... INCO Monel Carbon Arc Welding Wire No. 20.

for **INCONEL**

Oxy-Acetylene... No. 42 Inconel Gas Welding Wire. For flux see **below.
Metallic Arc... Inconel Metallic Arc Welding Wire No. 32.

for **NICKEL-CLAD STEEL**
(for welding of Nickel side)

Oxy-Acetylene... No. 41 Nickel Gas Welding Wire.
Metallic Arc... INCO Nickel Metallic Arc Welding Wire No. 31 and No. 35†.
Carbon Arc... INCO Nickel Carbon Arc Welding Wire No. 21.

●

FLUXES

*INCO Gas Welding and Brazing Flux for Monel Metal.
** "Cromalloy" Gas Welding Flux is recommended for Inconel.
† For vertical welding.
No flux is used for the gas welding of Pure Nickel or Nickel-Clad Steel.

●

INCO welding materials as listed can most conveniently be obtained through regular INCO distributors.
Detailed welding instructions furnished on request.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

The Welding Engineer

VOLUME 20 APRIL, 1935 NUMBER 4

Gas Welding and Silver Soldering Monel Metal and Nickel . . .

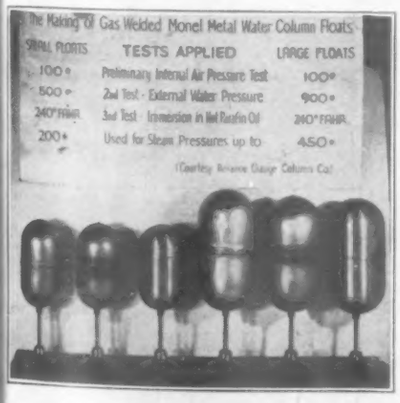
■ By F. G. FLOCKE and J. G. SCHOENER

Development & Research Dept., The International Nickel Co., Inc.

THE oxyacetylene welding of nickel and monel metal has been practiced quite satisfactory for more than a decade. This process has been used successfully in the fabrication of all types of equipment in the chemical field, as well as in many applications far afield of the chemical industry. Improvements in recent years in both fluxes and welding rods have aided in the advancement of the welding of high-nickel alloys.

The appearance of a properly made gas weld in monel metal or nickel is quite similar to that of a good steel weld. The surface is smooth, not rough or burnt, the ripples are clearly distinguishable, and there is no sign of porosity.

The practical considerations in the gas welding and silver soldering of monel metal and nickel are given below. This method of welding is of great importance in the fabrication of corrosion-resisting equipment. The arc welding of these two metals will be covered in a later article.



Gas-Welded Monel-Metal Water-Column Floats After Testing.

(The deep-drawn halves of the floats are trimmed with a small flange, then assembled over an internal ring. The standing seam is fused down on an automatic oxyacetylene welding machine. Note the high pressures to which the floats are tested.)

There are three essentials necessary to the satisfactory completion of a job: (1) correct materials, including welding rod, flux, and material being welded; (2) proper setting up of the job, which includes proper spacing of edges to be welded and jigging so as to hold the work in place during welding; and (3) proper procedure.

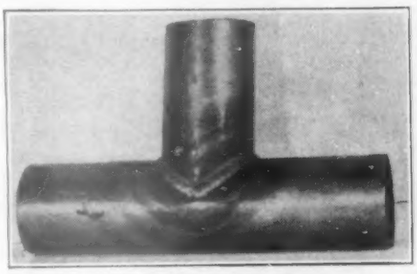
In the main, the oxyacetylene welding of nickel and of high-nickel alloys is much the same, with only minor variations. These are both strong materials, somewhat stronger than common steels.

Rods Generally Should Be Similar to Metal Being Welded

Welding rods are, in general, of the same composition as the material being welded. This is necessary, as comparable corrosion resistance with lack of galvanic effects is almost universally desired. The manufacturers of nickel and monel metal undertake to furnish proper welding rods where these are specified. The wire should be bright annealed, soft, and free from oxide. Not every wire, even though of normal composition for the alloy in question, will give satisfactory results. Rod to be used for welding should always be so specified.

In introducing a steel welder to the welding of nickel alloys, it is often found that he puddles (boils) the metal excessively, or tends to use too high a heat. For the best results on high-nickel alloys there should be little puddling; the molten pool should be kept quiet, with the tip of the luminous flame just touching its surface.

Puddling burns out the deoxidizers, which are important ingredients of these



Oxyacetylene-Welded Nickel Tee.

(Nickel welding wire used, with no flux. Note the uniform ripple on the surface of the weld.)

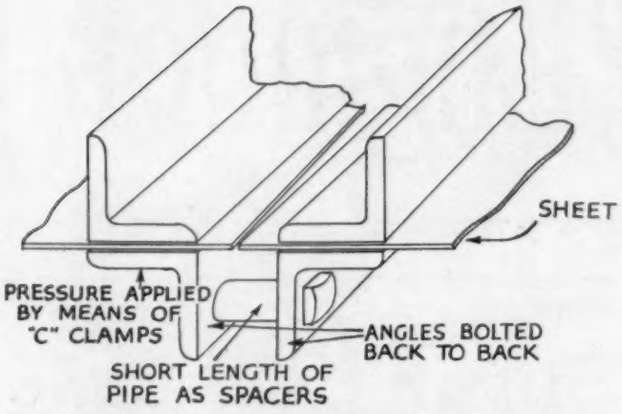
alloys although present in very small amounts. These deoxidizers are sufficient to insure good physical properties and are present in sufficient excess in the welding rods. However, if the welder puddles and boils the metal excessively, he will take the "life" out of it by removing the deoxidizers, and hence obtain a brittle and gassy weld.

Use Flux When Welding Nickel Alloys

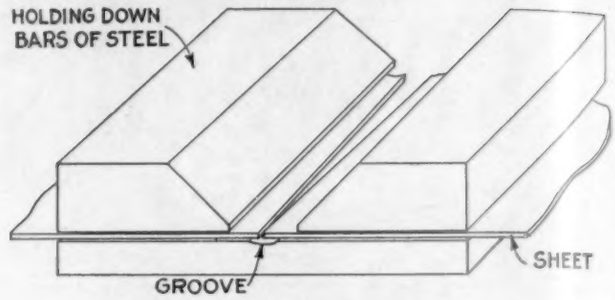
A flux is always used for monel metal but only seldom with pure nickel. There is a two-fold purpose in using flux—namely, (1) to protect the metal from oxidation and to dissolve oxide, and (2) to improve the fluidity of the molten metal.

When using Inco gas-welding and brazing flux, the preferred method is to dissolve the dry flux in boiling water to the consistency of a thin paste. This paste is painted on the joints to be welded, top and bottom, and a little is painted on the monel gas-welding rod. The flux is also used as a dry powder by dipping the heated end of the welding rod into it, though with this method

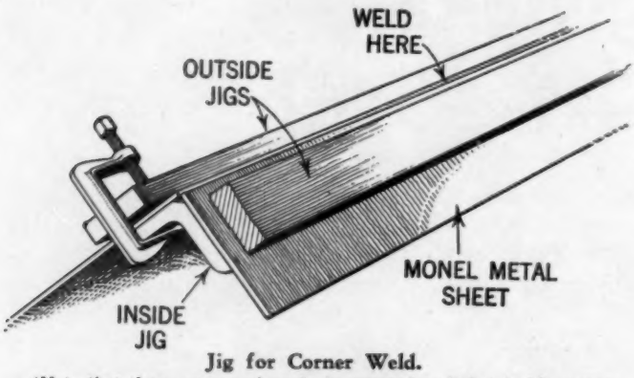
JIGS FOR HOLDING SHEETS IN POSITION FOR WELDING



Angle-Iron Jig for Making Butt Seams on Sheet.

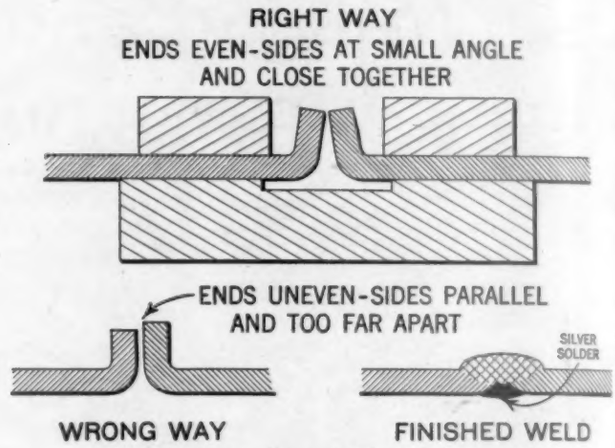


Another Type of Jig for Butt-welding Sheets.



Jig for Corner Weld.

(Note that sharp corner of angle is removed and that inside corners of sheet are just touching. Angles can be used instead of rectangular bars.)



Holding Sheets in Place for Making Edge Weld.

(Angles are sometimes substituted for top rectangular bars. Silver solder is frequently applied to obtain a smooth surface on the inside of the seam.)

the welder has either an excess of flux or none at all during welding. By painting on the flux in the form of a paste, uniform flux conditions exist.

It is well to paint an ample amount of flux on the underside of the joint to be welded, as then it is easy to obtain complete and proper penetration and the weld metal penetrating through will be bright. With reasonably careful handling, this practice insures fusion of the metal completely through the sheet to form a shallow reinforcing bead on the under surface of the seam. When used in paste form, the flux is painted on the seam and on the welding rod with a small brush or acid swab.

This flux does not corrode the high-nickel alloys and need not be removed on that account. However, it is usual procedure to remove it as a matter of cleanliness, and this is easily done by dissolving in warm water.

Ordinary borax is used widely as a general welding flux and, due to its valuable properties, has often been advocated as a welding flux for high-nickel alloys. It is not considered a suitable flux for monel metal or nickel. Borax improves fluidity of the molten metal, but when present in large proportions the extra fluidity is accompanied with lack of ductility in the finished weld. It does not dissolve the metallic oxides sufficiently to produce the very clean appearance sometimes necessary, and it is rather difficult to remove.

Reducing Flame Prevents Oxide From Forming

The oxyacetylene flame should be very slightly reducing—that is, a little excess acetylene with only a slight feather, no longer than ⅛ in., showing beyond the tip of the luminous cone. In an oxidizing flame, when welding monel metal, copper oxide (Cu_2O) forms and dissolves in the molten metal, rendering the alloy brittle and less resistant to corrosion. While a neutral flame is preferred, it is seldom that a set of gauges handled by the average welder will give an absolutely true neutral flame after a short period of use. There is usually some waver either toward the oxidizing or the reducing side; therefore as a matter of safety, a slightly reducing flame is recommended.

It is desirable, during actual welding, always to keep the end of the welding rod well within the flame so as to prevent the oxidation that would result if the hot rod were brought outside the protecting flame envelope into the open air. Besides being reducing, the flame should be soft rather than harsh, as is the case when too small a tip is used.

The proper size of tip is best determined by the welder's judgment. If the welding progresses too slowly, it is logical that he should increase his heat either by a larger flame with the tip already in the torch or by putting in the next size larger tip. Conversely, if he is hurried and as a result burns holes in the metal, and the weld metal is boiling instead of being quiet, obviously the heat should be reduced.

It is difficult to say, with any degree of certainty, just what tip size to recommend for a particular gauge of metal because of the various factors entering, though as basic practice the same size or one size larger than that recommended by the torch manufacturers for similar-gauge steel may be used.

Jigs Hold Sheets in Place for Welding

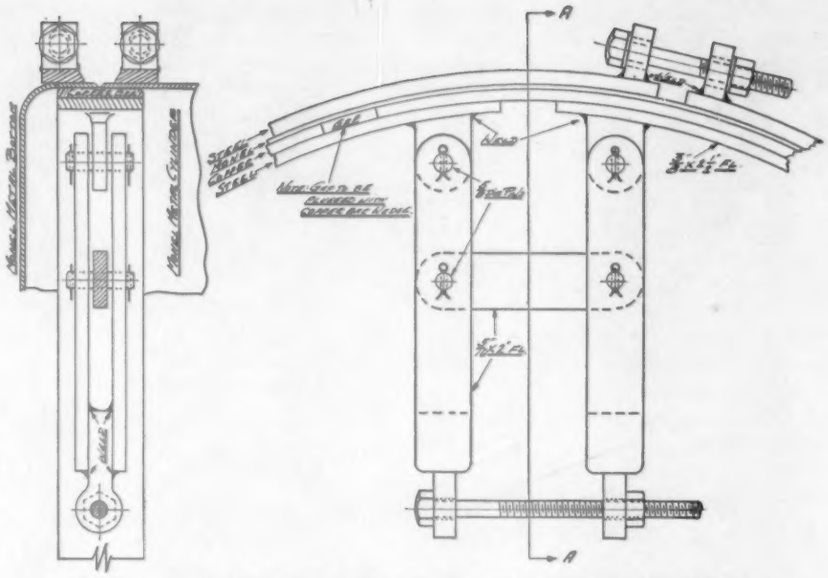
The use of skeleton jigs is recommended as highly desirable for holding the edges being welded in place and in line. While casual observation may seem

to indicate that jigs are expensive and time-consuming to use, quite the contrary is the case for they keep buckling down to a minimum and also permit more rapid welding, as the welder does not have to stop frequently to line up the edges to be welded as he progresses down a long seam. Simple skeleton jigs are preferred, as they are easily made, pieces to be welded are easily clamped to them, and, being light in weight, they do not absorb much heat.

By using C-clamps for holding the jig together when in use, metal-to-metal contact is obtained between the jig and sheet, and the jig also acts as a chill, absorbing heat that would otherwise work into the sheet and warp it. Copper bars have a maximum heat absorption, and they can be used where a minimum of buckling is desired. A groove in the backing-up strip directly under the weld permits more rapid welding and allows the bottom edges of the sheet to be thoroughly fused. On a corner weld, the sharp corner of the inside jig angle is filed away slightly for the same reason.

Flange the Edges of Thin Sheets Before Welding

The welding of thin gauge metal is not difficult. This is accomplished by flanging the edges slightly less than 90°, the turned up edges being as short and as nearly the same height as possible. Before assembling, the bottom and top of the seam are painted with a paste flux. No welding rod is needed, the edges merely being melted down with the oxy-acetylene flame. The crevice on the underside is filled in either with soft solder, silver solder, yellow brazer, or white brazer, depending on the corrosion problem involved. This procedure would be used in making long seams with thin gauge sheets, and in the making of spherical floats by welding two half-sections together.



Welding Jig for Girth Butt Joints Between Flanged Bottom and Shell.

One torch manufacturer has a line of torches with the vital parts made of monel metal because of its inherent toughness and strength. The handle, formed from strip rolled into a cylinder, is welded by using the edge weld described above; of course, fluxing before welding.

Butt joints are the most desirable and widely used type of joint because under operating conditions all forces act in straight lines through the joint. Practice alone can set the lower limit of sheet thickness at which butt joints can be made in light-gauge sheet, though ordinarily 0.050 in. or 0.043 in. (18 or 19 gauge) is generally considered as light as one can conveniently weld with butt joints. However, on short welds it is possible to go many gauges lighter, but this requires practice.

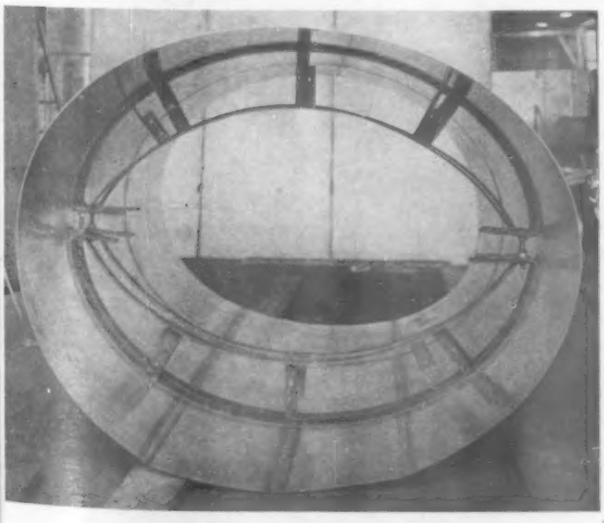
In determining the proper set-up for butt joints, no definite or specific recommendation can be made regarding the spread at the far end of the seam, because such factors as tightness of C-clamps, speed of welding, and thickness of sheet are variables requiring consideration; but, as a guide, 3/16 to ¼ in. spread per foot of seam can be allowed. If, in welding, the seam is closing up too fast, either the clamps can be tightened or a wedge placed in the seam for a few moments to retard the rate of closing. Conversely, if the seam is not closing up fast enough, the clamps can be loosened a little.

In setting up girth seams, a uniform opening is maintained, usually about half the thickness of the sheet being welded; for example, with ⅛-in. sheet, about a 1/16-in. opening is suggested for the girth seam. The seam is then tacked every 4 to 8 in. depending on diameter, etc., the tacks being about ⅛ to 3/16 in. long. When welding over tacks, always remelt the tack completely and add filler rod as in regular welding.

Piping or Tubing Is Readily Welded or Silver Soldered

Coils are a necessity in many of the process industries. These are exposed to the chemical being processed on the one side and to either a heating or a cooling medium on the opposite side. Seamless tubing and pipe are available in both monel metal and nickel for just such coil or manifold work. In the fabrication of these, several types of joints are used. With I. P. S. pipe or heavy-walled tubing, gas welding is generally used, the ends being beveled to a total of 90° and then tacked on opposite sides with an even spacing at the base of the vee of about 1/16 to 3/32 in., depending on the diameter and wall thickness. A straight butt joint is used, no jigging being necessary.

For tubing of about 0.078 in. or lighter



Skeleton Jig for Girth Seams in Truck Tank.

(Note jacks for spreading top and bottom sections.)

wall thickness, the joint is made by gas welding or by silver soldering, either as a sleeved joint or a bell-and-spigot joint. The most important requisite is that the fit be good—that is, not tight on one end and loose on the other, but fit over the entire length.

The higher grades of silver solder are remarkably free-flowing on these metals and penetrate very quickly to considerable depth, the thin film between two closely fitted surfaces giving excellent strength and a sound joint with the minimum of solder. Thus used, silver solder is not too expensive. Of course, it should not be laid on heavily in a loosely fitted joint.

Silver-Soldered Joints Are Immune to Many Corrosive Conditions

Smaller storage tanks, as well as dyeing machines of all types and sizes for the textile industry, are made of light-gauge metal, 0.050 in. or thinner, and are fabricated by lock-seaming and silver soldering. Silver solder is resistant to many of the corrosive conditions to which the high-nickel alloys are resistant. After the tank is entirely lock-seamed, the seam is fluxed top and bottom to aid in the flow of the silver solder and to dissolve the oxide on the underside.

A silver solder has been developed having a low melting point and a flow point of 1325° F. This solder is valuable in preventing cracking of the monel metal, as it allows the sheet to be kept several hundred degrees below the cracking range during soldering. This effect has never existed in nickel, as nickel is literally free of hot-shortness. Another solder recently introduced flows freely at 1175° F. and is recommended for use with nickel and monel metal; a strong, ductile joint is obtained.

A very small oxyacetylene torch is recommended for this type of silver soldering, or, better yet, a lead-burner's torch. The brazing goes along just like gas welding, with only a small portion of solder molten, and with the torch always kept moving, preferably in line with the seam. The tip of the luminous flame is kept close to the surface of the pool. Thus unnecessary heating of the sheet by the large envelope of the flame is avoided by getting the hottest part of the flame where it will do the most work quickly. Silver soldering is somewhat faster than welding.

In the use of the oxyacetylene flame in silver soldering, it should never be forgotten that the concentration of heat in a properly regulated flame is enormous, and that the flow point of silver solders is much below the flame temperature. Too much heat is dangerous to monel metal and also to the solder. The sheet metal should never be hotter than necessary to thoroughly flow the silver solder, otherwise the sheet may be cracked. With proper care, no difficulty will be experienced. Work should start about 2 or 3 in. from an edge and proceed toward the edge to avoid serious difficulty.

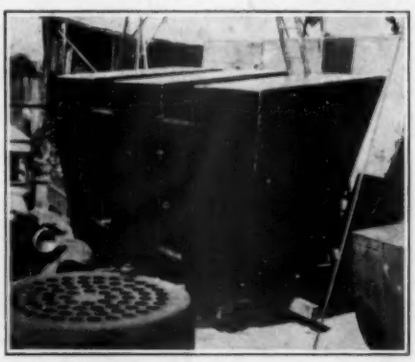
The variations in the above general principles that can be made are many. Obviously, the use of the oxyacetylene flame in joining monel metal and nickel is entirely practicable for a wide variety of seams and forms of metal.

Tailor-Made Fuel-Oil Tanks for Fishing Boats

By W. E. ARCHER

On account of the limited and irregular space available, much planning and calculating are required in the construction and installation of fuel-oil storage tanks in boats used off southern California and Mexico in the tuna-fishing industry.

The accompanying illustration shows some of the irregular-shaped tanks under



Welded Tanks Fit Boat Contour Without Wasting Space.

construction in the fabricating yards of the Shockey Boiler Works, in San Diego, Calif. The outside flat plates are ¼ in. thick, while the heads and irregular portions are of 3/16-in. plate. Much steel is also used inside the tanks as baffles and stiffeners.

The tanks shown are 10 ft. long, 6 ft. deep, and 4 ft. wide, tapering to near a point at the front end to conform to the space within the boat. Lap joints are used, the seams being are welded both inside and out. The tanks first are welded on the inside with intermittent welds, about 6 in. long and separated by 4 to 6 in., after which the finishing weld is laid along the entire joint. All heads are flanged and welded in much the same manner.

In order to have the necessary storage capacity for the fuel required in long cruises, it is often necessary to make the tanks of very unusual shape in order to fit them around the equipment and into the odd spaces available. Three of the tanks shown herein have a capacity of about 3,000 gallons.

H. K. Shockey, manager of the fabricating concern, states that he recently completed the construction of 13 of these "tailor-made" tanks for a local fishing and canning company.

Welding Generator Detects Plugged Conduit

In pouring concrete in large powerhouse recently, some conduits became plugged with cement. Since no one knew exactly where the pipes ran in the floors and walls, the problem was to locate them without digging up unnecessary parts of the flooring. By connecting the electrodes from a welding generator to the ends of the pipes and using an ordinary compass, the Service Department of the Canadian Westinghouse Co. was able to draw a chalk line directly over the pipe in trouble. Then a fish tape was used to measure the distance from the ends to the plugged portion, making it possible to break out the concrete directly at the point of obstruction.

In spite of the fact that the pipes were 14 in. below the surface, half an inch or less deviation from the direct line could be detected by the compass needle.

Sheriff Delivers Job-Shop Letters to Farmers

The sheriff of LaCrosse County, Wisconsin, recently served 650 farmers with subpoenas, consisting of a letter from the Randall Welding Co., calling the farmer's attention to the service offered by the welding shop and how the farmers can save money by having their worn and broken equipment saved from the junk heap by welding. Dan E. Randall, manager of the shop, says that the novel method of using a subpoena got quick attention and brought the shop considerable new business. The letter was well phrased and cited actual examples of savings that could be effected by repairing plow shares with "New Process" points.

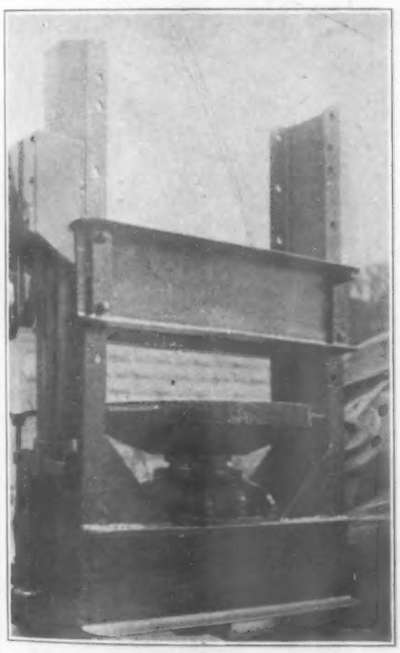
Uses Magnets to Hold Small Parts for Welding

"Here's a kink that is invaluable to the job shop," writes Ivo V. Pennington, of Pennington's Garage, Wauneta, Neb., one of the most progressive welding shops in the state. "Procure a number of horseshoe magnets from high-tension magnetos, Ford-T flywheel magnetos, or the like. Use them to hold small articles made of steel in alignment. They will hold small rods, flats, etc., that are so small that the blowpipe flame tends to move them out of alignment. This kink has saved us many burned fingers."

Truck Equipped With Welder and Hydraulic Press.

Portable Welder Equipped With Shop-Made Press

For field welding, Guy Stoner, of Fort Dodge, Iowa, has built a portable outfit consisting of a 1-ton Dodge truck carrying a 300-ampere welder and a 50-ton hydraulic press, and having a capacity of 800 lb. of welding wire and 100 ft. of lead cable. The welder is driven from the truck motor by a split drive shaft, power take-off and seven V-belts. To start the welder, a push button on the dash is operated to cut in the governor. Then a lever is pushed forward, and the gear-shift lever put in high. The clutch is let in, and the machine is ready to pull 5/16-in. wire all day long. The motor speed is 1000 r.p.m. and the welder operates at 1500 r.p.m. An outlet at the top door supplies power for lights, grinder or electric drill.



Press Built Up From the Scrap Pile By Welding.

The hydraulic press is of particular interest, since it is made entirely of parts taken from the scrap pile, completely assembled by welding. The equipment includes a 12-volt Dodge starter motor, the current to which is applied by the welder.

This outfit has been in service for a year with no adjustments or repairs, and has been called out on many jobs at distances of 100 to 250 miles, and one job was located 749 miles away. A speed of 65 miles per hour can be obtained on the road. The governor remains stationary while the truck is running.

Program Announced for Wisconsin Conference

The program of the welding conference to be held at the University of Wisconsin, Madison, Wis., on May 2nd and 3rd, has been announced by Prof. J. M. Dorrans, as follows:

"All-Welded Farm Buildings," by J. Shodron, chief engineer, James Mfg. Co.
"Importance of Design and Workmanship in the Development of Welding," by J. W. Owens, director of welding, Fairbanks, Morse & Co.
"Hard-Facing" by Don Llewellyn, research engineer, Air Reduction Sales Co.
"Facing Facts in Job Welding Costs," by L. C. Monroe, advertising manager, *The Welding Engineer*.
"Illustrating the Electric Arc" (with film), by E. J. Brady, research engineer, Chicago Steel & Wire Co.
"Metallic Arc Welding of Aluminum Tanks," by Arnold Meyer, research engineer, Heil Co.
"Alternating Current for Heavy Welding," by W. M. B. Brady, arc-welding specialist, General Electric Co.
"Effect of Welding Heat on the Properties of Malleable Iron," by Scott Mackay, professor of mining and metallurgy, University of Wisconsin.
"Problems of the Job Welder," by J. M. Brey, Madison Welding Co.
"Weld Testing and the Qualification of Operators for Oxyacetylene Welding," by W. B. Browning, The Linde Air Products Co.

All-Welded Residence Has 12 Rooms

Contributing interestingly to California's structural progress in 1935, a new twelve-room, two-story, all-welded steel-frame residence is now under construction in Outpost Estates, in Hollywood.

This residence frame has been completely shop fabricated and welded in wall units. From this method of unit-type construction, the Unitype Builders, Inc., general contractors as patentees of the system, have taken their name. The house is situated at 2227 Outpost Drive, and will be one of the outstanding residences of the Hollywood district.

The frame was completely set in place, assembled and welded within five days. This speed was made possible by the care with which the wall units were designed. Two men can easily raise and set any unit in place. Windows and doors are placed in the same manner as in other buildings, with the steel sash welded into the steel wall framing units. Bronze screens will cover all window openings.

Several group meetings of school classes and professional bodies inspected the house during erection of the frame. Also, classes from the California Institute of Technology were visitors, while nearly 100 members of the Structural Engineers' Association of Southern California, many of whom are school-designing engineers, made a special visit to study the construction.

Carleton M. Winslow, A. I. A., of Los Angeles, is consulting architect for the builders.

Drum for Sand-Blasting Is Made From Scrap

The portable air drum shown in the illustration was fabricated by welding scrap tubing and angles, and was used to good advantage both for painting and sand-blasting during the construction of a large refinery. A 30-in. section of pipe was reduced at one end to 4 in. by slitting with a cutting torch, bending the sections and then welding. The bull plug at the bottom of the drum was inserted in the reduction. The base and legs of the unit were welded on and a short length of 4-in. pipe, threaded to receive a plug, was welded into the head for insertion of sand or paint, as the case might be. Hose was used on the short fittings at the top of the unit. The drum was easily moved to any point on the job where it was needed.

Tubing and Angles Make Up This Drum.

Alternating-Current Welding

A description of heavy-duty welding equipment, together with a discussion of power factor, secondary voltages, and inherent characteristics of a. c. welding. From a paper presented at the Iowa State College Welding Conference, Ames, Iowa, January 23-25, 1935.

■ By W. M. B. BRADY
Welding Specialist, General Electric Co.

THE development of heavily coated shielded-arc electrodes has added physical and metallurgical weld-metal properties essential to meet the Class I Pressure Vessel requirements of the A. S. M. E. Code, and this same type of electrode also makes it possible for industry to use the a.c. arc-welding process. A.c. arc-welding equipment is of course an addition, supplementing the line of direct-current equipment and not replacing it.

Transformer Equipment for A. C. Welding

Standard rating of a.c. arc-welding transformers available run up to as high as 750 amperes continuous rating. The secondary open-circuit voltages most commonly used are 80 and 90 volts. These may be provided by taps on the primary.

In general, arc-welding transformers are of a special design, in which reactance is incorporated for the purpose of reducing the terminal voltage from the open-circuit or striking voltage to that required at the arc. Means is provided for adjusting the amount of reactance or changing the path of magnetic flux, at will, by which the different values of welding current within the welding range of the unit are obtained. Such adjustments are made by simple control arrangements, plainly marked to indicate the proper setting for each type of work.

Transformers may be air cooled by natural draft and enclosed in strong metal cases to prevent mechanical injury. Where instruments are provided, secondary volts or amperes may be read at a glance. By enclosing the primary terminals, no high-voltage live parts are exposed, after connection has been made to the power supply. Secondary terminals can also be enclosed in a separate housing. Eye bolts located in the top of the unit permit the transformer to be lifted by a crane. The transformer may be mounted on a strong 3-wheeled steel truck, for shop handling.

A.c. arc welding may be applied to either hand or automatic operations. The transformer equipment is the same in either case.

The Problem of Single-Phase Loading

The power factor is approximately 0.5 at any load, and the load is single phase. In this connection, I might say that single-phase operation, from actual experience in many plants using the transformer-type equipment, has shown that the phase unbalancing due to the single-phase load is negligible, on account of the relatively small kva. load of the transformer-type welder compared to the connected load. In the case of an industrial concern with small power load, while no accurate figures are readily available, it is certain that there is much single-phase spot, butt and seam welding equipment, and many single-phase rivet heaters now in daily use, having an equal unbalancing effect on the power lines, but causing little or no concern. In any case, a distribution of several such single-phase units on a polyphase system usually restores an adequate balance to the system.

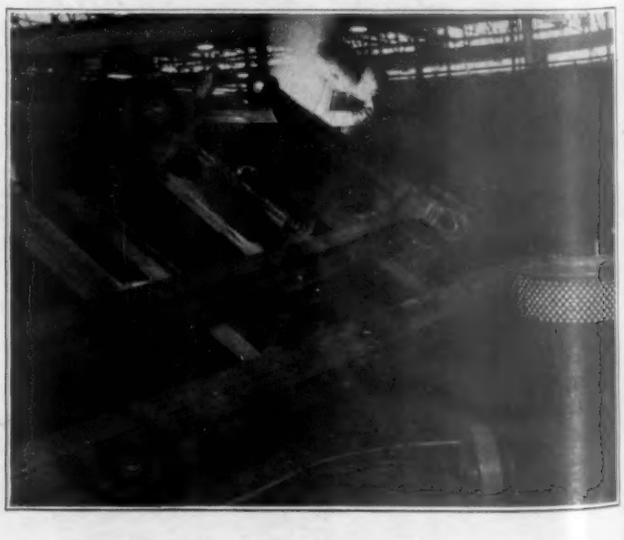
In any discussion of the power factor of transformer welders, comparison should be with motor-generator sets involving induction-motor drive which have a maximum of 90% power factor and an average of about 85%. Many power companies make no issue of this point. Also many customers have synchronous-motor-driven shop equipment with which to improve the power factor. However, if necessary, capacitors may be used to provide any desired power factor, although very few have been installed.

Fear of danger from a.c. equipment is mainly psychological. It is inherited from the early history of such equipment, when secondary open-circuit voltages were in the neighborhood of 125 volts, as compared with d.c. voltages averaging about 60. With heavily coated electrodes, the most satisfactory open-circuit a.c. voltage appears to be about 80.

Means for Automatically Reducing Secondary Open-Circuit Voltage

However, as this fear may still persist, and until further experience educates the users, auxiliary devices are available which automatically reduce the open-circuit voltage to about 50 volts, and automatically restore full open-circuit voltage when welding is resumed. These attachments are really unnecessary, and although they are successful in their operation, we do not recommend their use because attachments of this sort always slow up welding operators to a certain extent. They are made available to meet what we believe to be only a temporary demand.

The advantages of the a.c. transformer type welder are: (1) low operating cost, (2) high overall efficiency, (3) no moving parts, (4) simple in construction, (5) low repair costs, (6) low



The Absence of Magnetic Blow With A. C. Welding Makes It Easy to Deposit the Metal in Confined Corners and Pockets.

Alternating-Current Welding on a Heavy Frame.

maintenance costs, (7) compact, (8) light in weight, (9) requires little floor space, and (10) requires no reversing switch.

Class I Pressure Vessels and Other Heavy-Plate Work

A.c. transformer-type arc-welding equipment is especially adaptable to thick plates, where heavy current is needed and high-quality fusion is obligatory, such as Class 1 pressure vessels built in accordance with the A.S.M.E. Code. Other examples are penstocks, oil-refinery equipment, high-pressure piping, and similar fabrication involving ¼-in. plate thickness and upwards.

A.c. welding is particularly advantageous when applied to confined corners and pockets with heavier-walled sections, where a d.c. arc would be badly affected by magnetic interference. Owing to the inherent characteristics of alternating current, the induced fields are opposite and neutralizing, therefore producing no magnetic blow and no interference or hindrance to the operator. This permits utilizing the full effect of the arc-stream deposit as directed, with complete penetration, and results in a sound, homogeneous weld exactly where required. A.c. welding has been successfully applied to fabricating heavy machine frames, structural equipment, base assemblies, machinery sections, etc.

Twelve Advantages Put Forth for A. C. Welding

The benefits of a.c. heavy-current welding are: (1) no magnetic blow, (2) high welding speeds (made possible by high current density in electrode), (3) lack of slag inclusions, (4) sound, homogeneous welds on heavy sections, (5) lack of porosity, (6) good penetration, (7) not fatiguing to operator, (8) spatter losses small, (9) high efficiency of electrode, (10) low welding cost per foot of weld, (11) good appearance of weld, and (12) uniform weld (due to constant arc).

Program of Papers for Welding Symposium

The preliminary program of the symposium on the welding of iron and steel, to be held by The Iron and Steel Institute, in London, England, on May 2nd and 3rd, includes four groups of papers and discussions. The first group will deal with present-day practice and problems of welding in the following industries: bridge and structural engineering, pressure vessels, railway material, shipbuilding, aeronautical, automobile, chain; electrical, heavy engineering and machinery manufacturing; and iron, steel castings and wrought iron. The second group of papers pertain to welding practice and technique, including welding apparatus. The third group will consider the metallurgy of welding, and the fourth group will deal with specification, inspection, testing and safety aspects of welding. The meetings will be held in the lecture theater of the Institution of Civil Engineers, on Great George St., Westminster, S. W. 1.

$125 in Cash Prizes for Reports on Hard-Facing

Prizes totaling $125 in cash are to be given by C. E. Phillips & Co., Detroit and Chicago, for the best reports on farm equipment hard-surfaced with Stoody products. There will be six prizes in all, as follows: 1st prize, $50; 2nd, $25; 3rd, $20; 4th, $15; 5th, $10, and 6th, $5.

In an announcement of the contest, C. E. Phillips & Co. state that all job welding and blacksmith shops are eligible to enter for the prizes. To enter the contest, the shop need only write the company for application blanks, and fill these out with the following information: Description of implement (whether plow share, disc blade, cultivator shovel, beet rooter, etc.); date hard-facing was applied; type of hard-facing used (whether Stoody Self-Hardening Rod, Silfram, Stoodite, or Borod, etc., or a combination of these); method of applying hard-facing; date hard-facing tool was delivered to farmer; name and address of tenant or owner of land on which implement was used; and service record after hard-facing was applied, such as number of acres plowed, etc., also type of soil—that is, whether loam, sandy, rocky, etc.

The record described on the application blank must have been made between Jan. 1, 1935, and June 1, 1935, and the application blank, completely filled out, must be mailed and postmarked not later than June 15, 1935. Any shop can submit as many records as it wishes, but no more than one prize will be awarded any one shop or individual.

Further details regarding the contest can be obtained from C. E. Phillips & Co., 5443 Twelfth St., Detroit, Mich., or from their Chicago office at 324 S. Jefferson St., Chicago, Ill.

Steelwork for New Bank of England Erected by Welding

Only recently has welding for buildings been sanctioned in the London, England, area, yet already this situation has been taken advantage of in the erection by welding of the steelwork for the new Bank of England building in London. About 7,000 tons of steel was involved. Shop fabrication was by riveting and the field work was welded. Quite a number of the girders were 60 ft. long, and these had to be transported to the site at night so there would be least interference with traffic.

The building has 12 floors, the lowest sub-vault being 50 ft. below the ground, and the top of the building 120 ft. above the street level. The site occupies about 1¾ acres.

Commenting on the advantages of welded erection, Dr. Andrew McCance, director of Colville Construction Ltd., which company supplied the steelwork, is quoted in *The Welder* as follows:

"All the parts of the building can be fabricated in the workshops in the most convenient and the cheapest way and this leaves only the work of erection to be done on the site. The Bank of England building is an excellent example of how this erection work can be carried out with the help of electric welding in a rapid and efficient way and withal so silently that everyone around can carry on his daily work, no matter how exacting it is, entirely undisturbed."

Each welder had to prove his ability by the making of test specimens before being allowed to do any welding on the site.

Colville Constructional Ltd. expects this year to put into operation an all-welded power house, built without the use of a single rivet.

Fig. 1. Steps in the Manufacture of Supernickel Condenser Tubing, Showing Relative Wall Thicknesses.

(Left: As extruded. *Center:* After cold rolling. *Right:* After final cold rolling.)

Supernickel:

Its properties and uses, and methods of fabrication . . .

■ By IRA T. HOOK
Research Engineer, The American Brass Co.

IN a compilation* made by the American Society of Testing Materials in 1930 of the copper-nickel alloys, 38 different compositions are listed in which copper and nickel are the major constituents. Small additions of manganese, iron, tin, aluminum, silicon, cadmium and lead may or may not be present. In the same compilation some 210 more copper-nickel alloys carrying zinc as a third major constituent are listed. Thus, it is difficult to select a single alloy from this long list and estimate its value to the metal user correctly. However, there are some properties of Supernickel and companion metals which distinguish them as being valuable engineering materials. Particularly is this true in situations where good corrosion resistance, combined with a reasonable structural strength and ductility, is a requirement.

For the past 125 years the designer of steam-engineering equipment has waged an untiring search for better and better materials. Wars and depressions have only accelerated the pace, and periods of prosperity have witnessed continuous research to the same end. The tremendous concentrations of steam power and the economy of steam-generating equipment are made possible only by the earnest cooperation on the part of the metal makers in aiding the engineer to put the correct metal into every part of the equipment.

*Volume 30, 1930, Part 1, page 357, *A. S. T. M. Proceedings.*

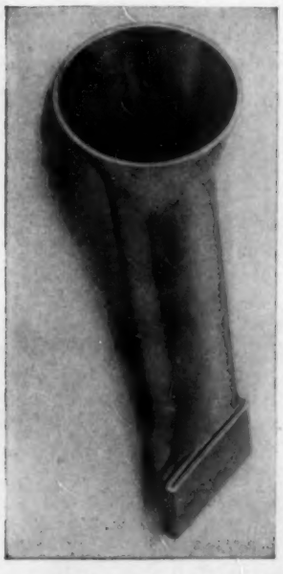


Fig. 2. Ductility Test of Annealed Supernickel Tubing.

(The circumference is stretched 20% by the expanding cone, and the tube is hammered flat and bent to a 180° flat-back, with no sign of failure.)

Metal Is Subjected to Severe Test When Used as Condenser Tubing

The condenser is perhaps the most important single piece of equipment necessary to the economy of a steam power plant. Needless to say, the efficiency and permanence of a condenser lie, more than anything else, in the type of tubes used in it. At the same time these tubes suffer a more than usual severe condition of service. Hot on one side, cold on the other, made extremely thin in order to increase the heat-transfer rate, corroded by boiler compounds in the condensate and by all manner of impurities in the cooling water, scoured free of all protective films by rapidly moving water, enormous surface exposed to the corroding agents, with a high vacuum on one side and pressure on the other, and still with the requirement that there must not be a single pinhole to weaken the vacuum or contaminate the steam water, one metal after another has been tried.

Copper would be ideal from the heat-transfer standpoint, but it is scoured clean of its protective patina, leaving the bare surface exposed to the attacking elements. Hence a metal having a higher resistance to erosion is commonly used. Brasses carrying small percentages of beneficial elements, such as the tin in Admiralty, or the aluminum in Ambraloy tubes, are used in considerable quantity. But the trend for several years has been toward the use of a copper-nickel alloy such as Ambrac, containing 20% nickel and 5% zinc, or Supernickel, which has 30% nickel, the remainder being copper.

Fig. 1 shows the various steps employed in the manufacture of high-quality condenser tubing. Fig. 2 shows a sample of annealed Supernickel tubing that has been given the usual severe ductility test.

The excellent performance of Supernickel under the severe conditions of service imposed upon it when used as condenser tubing, has attracted attention to the metal for other purposes, such as tubing for handling salt water aboard ships, containers for handling corrosive substances in some of the chemical industries, etc. Thus, while Supernickel, as the 70/30 cupro-nickel, is not a new alloy, its introduction to the trade is comparatively recent. It has won recognition by reason of its in-

herent good qualities. These properties are stated briefly as follows:

Annealed Metal Has 50,000 Lb. Strength and High Ductility

Strength and Ductility—In the annealed condition it has a tensile strength of 50,000 lb. per sq. in. with an elongation in 2 in. of 45%. Cold worked, the tensile strength may be raised to 75,000 lb. per sq. in. with a residual ductility measured by 5% elongation in 2 in. Due to the high nickel content, it retains its strength at elevated temperatures better than most copper alloys.

Malleability—It can be hot forged and cold rolled, or drawn. In sheet metal it withstands severe drawing and bending operations.

Metallurgical—Like most of the corrosion-resisting alloys, it is a solid-solution metal, all in the alpha phase. Nickel and copper are mutually soluble in all proportions. In Supernickel we have 30% of nickel dissolved in 70% of copper. It has a nickel-white color and its surface can be buffed to take a brilliant polish. A small percentage of manganese acts as a deoxidizer and desulphurizer, contributing thus to the soundness and density of the metal.

Supernickel Is Readily Soldered, Brazed or Welded

Supernickel can be readily soft soldered, silver soldered, brazed, fusion welded and resistance welded. For soldering and brazing, no especial procedure is necessary. As in all good work, the metal must be clean to start with and covered with a film of suitable soldering or brazing flux to protect the metal until the solder melts.

In the joining of Supernickel tubing in line connections and to fittings, the Anaconda-type recessed bronze fittings secured to the tube with Easy-Flo brazing alloy, applied with Handy flux and the oxyacetylene torch, may be used. Supernickel tubing can be butt welded and connections to suitable fittings can be made with the special Supernickel gas-welding rods. Such fusion welds require a higher degree of skill on the part of the welder than the use of the brazing alloy.

For fusion welding, however, a more exact procedure must be followed. The very refractory nickel oxide interferes with the welding operation if allowed to form. Moreover, the metal, when in the molten state, is prone to take up gas which it rejects on freezing. The welding problems, therefore, resolve themselves into (1) the prevention of oxidation in metallic-arc welding and (2) the protection of the molten metal both from oxidation and from contact with the hot gases in oxyacetylene welding.

Nothing has been done up to the present time with carbon-arc welding. It has been assumed that carbon from the incandescent carbon vapors in the carbon arc would be taken up too greedily by the molten nickel alloy, but it is possible that a searching investigation will show some very good applications of the carbon arc just as has been done in the welding of steel.

Metallic-arc welding of Supernickel requires a flux-coated Supernickel welding rod. The function of the flux coating is the same as the heavy coating of flux used on steel welding rods—that is, to protect the metal from oxidation from the time it is melted until it cools below the heat tinting range. A suitable flux coating has been developed for Supernickel.

Used with reversed polarity, these flux-coated Supernickel welding rods fuse the base metal and deposit a clean, sound weld metal nearly identical in composition to the base metal and with sufficient strength to develop, with but slight reenforcement, the full strength of the annealed base metal. Note that the metallic-arc weld in Fig. 3 has developed the full strength of the ⅛-in. Supernickel sheet.

Protect Puddle From Hot Gases

For oxyacetylene welding, a different type of welding rod has been developed. In this case, the metal is not superheated to the same degree that obtains in weld metal passing through the electric arc. The metal is heated only slightly above its melting point; and in the welding of relatively thin sheets (⅛ in. and under), it is solidified again almost instantly.

Moreover, the torch gases (consisting of hydrogren, carbon monoxide, carbon dioxide and water vapor) are reducing in nature, or neutral. Hence, it is more important to provide protection from contact with such highly soluble reducing gases as hydrogen and carbon monoxide than to provide protection from oxidation, in addition to that given by the hot neutral gases.

The function of the flux, therefore, becomes simply that of cleansing the metal of occasional oxide to promote free flowing. It would also be desirable to have the flux cover the metal until it cools below the heat tinting range. For these purposes, a good brazing flux functions reasonably well, though it fulfills the second requirement only indifferently.

In order, however, to keep the gases from contact with the molten metal, a more impervious and intimate shield is desired. A Supernickel gas-welding rod has been developed for the purpose.

Fig. 5. (Right) Transverse Section of Oxyacetylene Weld in ⅛-In. Supernickel Sheet.

Fig. 6. (Left) Oxyacetylene Weld in ⅛-In. Supernickel Sheet, Showing Excellent Ductility Obtainable.

(a, Top of weld on outside. b, Bottom of weld on outside.)

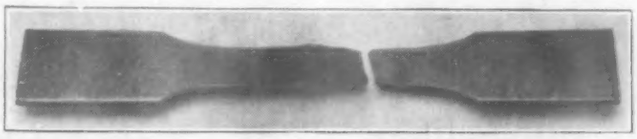


Fig. 3. (Right) ⅛-In. Supernickel Sheet Welded by the Metallic Arc, Using Flux-Coated Supernickel Electrode.

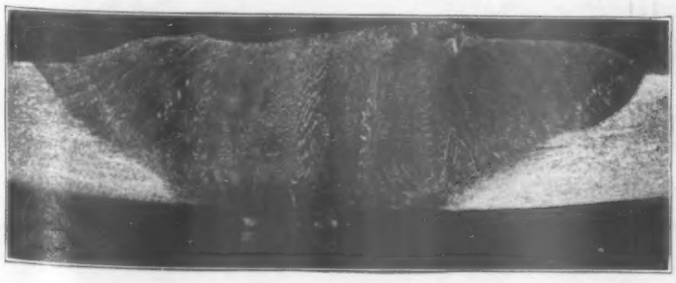


Fig. 4. (Left) Macrograph of Transverse Section of Weld in Fig. 3.

(Note soundness of weld metal. The Supernickel sheet was clamped hard against a copper backer to make this weld.)

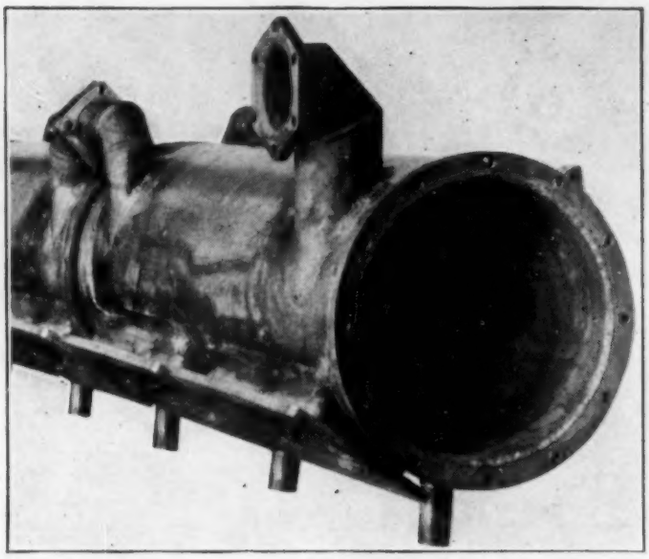


Fig. 7. Exhaust Manifold for Marine Diesel Engine, Made of Fusion-Welded Supernickel.

(Photograph courtesy of the A. O. Smith Corp.)

This special welding rod is nearly identical in composition to the base metal, but it carries alloyed elements which combine with the copper and form a closely adhering glass, covering completely the molten metal and protecting it from contact with the gases.

The oxyacetylene welding procedure, therefore, consists simply of the use of the oxyacetylene torch with a very slightly reducing flame, a good brazing flux, and the special bare Supernickel gas-welding rod.

The exceptionally fine grain and soundness of the weld metal shown in Fig. 5 explains the excellent ductility of the weld illustrated in the flat back samples of Fig. 6.

Use Technique That Will Eliminate High Cooling Strains

Supernickel, like most nickel alloys, has a high temperature range in which it is hot-short. For this reason, the metal should be as free of strain, particularly bending strain, as possible when it is being welded. The shrinkage strain following the dissipation of the welding heat usually does no damage—the metal is in its red-ductile or black-ductile range. But in order to minimize this hazard, the welding should always be done as rapidly as possible or advantage taken of the lower strains incurred by intermittent welding or backsteps. The use of a copper backer in metallic-arc welding of sheets helps toward the same end.

Wherever possible, in welding Supernickel with the metallic arc, the base metal should be clamped securely to a copper backer. Copper is particularly desirable, as the sheet can be closely held without danger of the weld metal sticking to it. At the same time, the weld metal solidifies quickly, eliminating in a large measure the shrinkage strains. In order that the required heat shall not be too great, the copper backer should be rather small, say ½x1 in., inserted in a steel or cast-iron jig or, if a larger copper bar be used, it should be relieved so that it will contact the base metal only ¼ in. on either side of the weld with perhaps an additional ¼ in. of bearing for 2 in. on either side of the weld. The backer should be grooved 1/16 in. deep by ⅛ in. wide immediately under the axis of the weld.

With oxyacetylene welding, the same type of backer cannot be used. The free weld, with about 2¼% opening, can be used wherever possible, the sheets being held to the proper position by the use of a light steel jig.

New Structural-Steel Welding Code

A revision of the Code for Fusion Welding and Gas Cutting in Building Construction, Part A (Structural Steel), has been published by the American Welding Society, 33 West 39th St., New York, N. Y., and is available from the Society at 25 cents each. This revision (1934 edition) contains many changes, and includes the following four appendices: Specifications for filler metal; qualification tests for operators of welding equipment; recommended welding practices; and weld symbols and notations.

Dr. Elihu Thomson Receives German Engineering Medal

The medal of honor of the Verein Deutscher Ingenieure, the outstanding award of the German engineering profession, was received on March 29th by Dr. Elihu Thomson, which date marked his 82nd birthday. Presentation of the medal was made in Boston by Herr Von Tippelskirch, German consul-general in that city, on the occasion of the meeting of the board of directors of the General Electric Co., of which Dr. Thomson was one of the founders. On the same day, in Berlin, more than a score of leaders in German science, industry, engineering and statecraft gathered to do honor to the recipient of the medal. E. W. Rice, Jr., accepted the medal on behalf of Dr. Thomson, whose health confined him to his home in Swampscott, Mass. This is only the second time this award has been given an American, the first American recipient having been the late Dr. Calvin W. Rice.

Welding Demonstrations at Portland (Ore.) Clinic

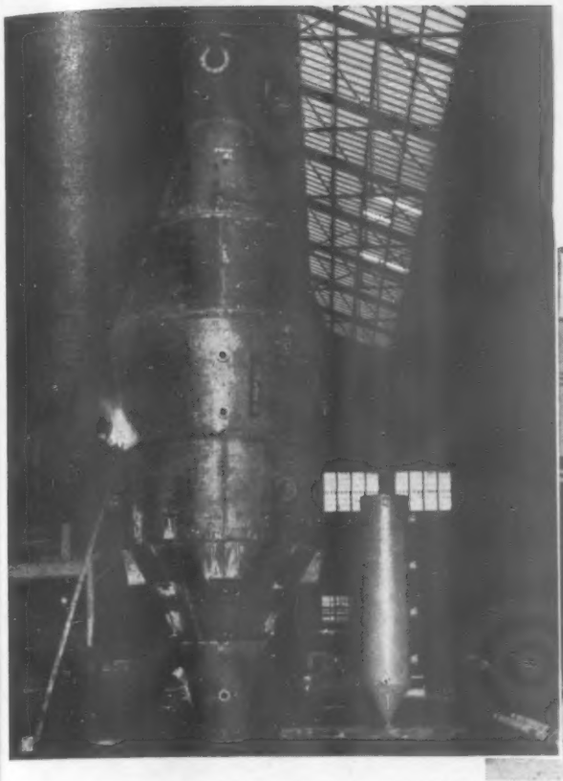
Between 600 and 700 were in attendance at the first annual welding clinic held by J. E. Haseltine & Co., Portland, Ore., March 21st to 23rd. The clinic was held in the company's new warehouse building at the corner of N. W. Second and Northrup Sts. Demonstrations were given of arc welding thin sheets, heavy plates, cast iron, and copper; welding of stainless steels; acetylene bronze welding; flame cutting; hard surfacing; brazing non-ferrous metals; use of fluxes; and chipping and grinding with pneumatic tools. Those participating in the demonstrations included V. W. Whitmer, of the Republic Steel Corp.; Gust Nyquist, of American Arc Welders; W. C. Swift, of The American Brass Co.; Ernest Daniels, of the Victor Welding Equipment Co.; Malcolm Westover, of Portland; Harry Utter, of the Independent Pneumatic Tool Co.; H. M. Yates, of the Anti-Borax Compound Co.; C. W. Gooderham, of The Linde Air Products Co.; Rufus Maier and Calvin Cooper, of the General Electric Co.; and Ralph S. Beeler, of J. E. Haseltine & Co.

Annual Business Meeting of American Welding Society

The 16th annual meeting of the American Welding Society will be held in the Hotel Pennsylvania, New York, on April 25th. The meeting will be devoted entirely to a transaction of business, and there will be no technical sessions. The program is as follows:

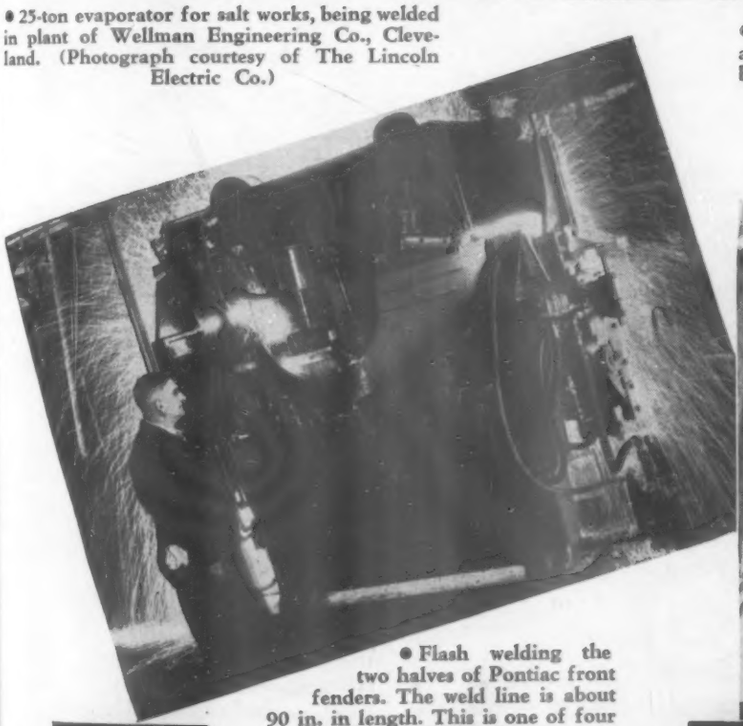
11:00 a. m. Business Session. D. S. Jacobus, presiding.
Report on Society Activities, by D. S. Jacobus, President.
Report of 1935 Nomination Committee, by J. H. Deppeler, Chairman.
Other business. Discussion.
2:00 p. m. American Bureau of Welding. C. A. Adams, presiding.
Reorganization of American Bureau of Welding.
Future work.
3:00 p. m. Structural Steel Welding Committee. L. S. Moisseiff, presiding.
Discussion of work under way.
Program of future activities.
6:30 p. m. Board of Directors' Dinner, followed by meeting. D. S. Jacobus, presiding.
Review of society activities during past administrative year.
Unfinished business.
Introduction of new president.
Appointment of officers and committees.
Plans for the coming year.

WELDING NEWS IN PICTURES

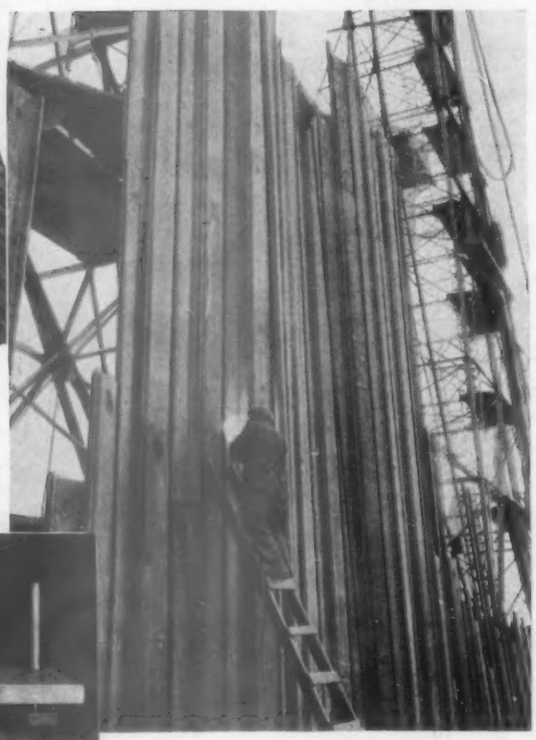


• 25-ton evaporator for salt works, being welded in plant of Wellman Engineering Co., Cleveland. (Photograph courtesy of The Lincoln Electric Co.)

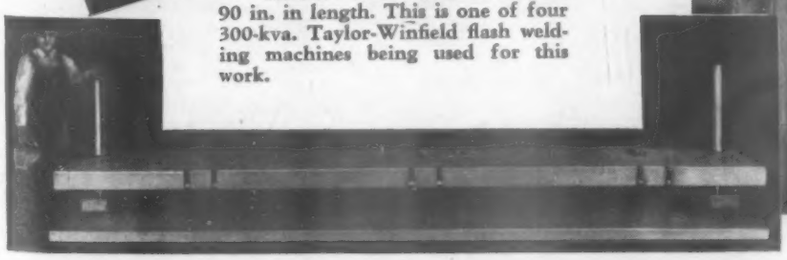
• All-welded bodies of 10-gauge, high-carbon steel are part of the equipment of this fleet of Ford trucks built for general road and forest improvement work in the Virgin Islands.



• Flash welding the two halves of Pontiac front fenders. The weld line is about 90 in. in length. This is one of four 300-kva. Taylor-Winfield flash welding machines being used for this work.



• Welding sheet piles in the "cut-off" wall at the Fort Peck dam in Montana, PWA's $50,000,000 giant project.



• A die set for automotive frames, torch-cut and welded from steel plate by Danly Machine Specialties, Inc., Chicago. It is 16 ft. long and 24 in. wide and weighs 10,900 lb.

Preparation for Welding or Cutting Which Have Held Combustibles..

(Tentative Recommendations of the American Welding Society, January 15, 1935)

SCOPE. — These recommendations are intended to apply to the preparation for welding and/or cutting of metal containers which have held flammable solids, liquids or gases. These practices are equally desirable where any such container is to be subjected to any type of hot work or any operation that might create a spark or flame.

(NOTE: See Regulations governing Marine Fire Hazards (1935), Appendix C, for partial list of combustibles.)

These recommendations do not assume jurisdiction over the following classes of containers:

1. Containers when entered by workmen for cleansing from inside.

2. Tanks, bunkers or compartments on board ship.

(NOTE: Covered by Appendix A of the Regulations governing Marine Fire Hazards, published by the National Fire Protection Assn., 60 Batterymarch St., Boston, Mass., also by "Suggested Good Practice for Safe Loading and Discharging of Oil Tankers," published by the American Petroleum Institute, 250 Park Ave., New York, N. Y.)

3. Outside above-ground, vertical petroleum storage tanks.

(NOTE: Covered by a Manual on Cleaning Petroleum Storage Tanks published by the American Petroleum Institute, Department of Accident Prevention, 1508 Kirby Bldg., Dallas, Texas.)

4. Gasometers or gas holders for natural and manufactured gas. It is recommended that the welding of gas holders be not attempted until such time as the American Gas Association has prepared a recommended procedure for such work.

5. Compressed-gas cylinders.

I. The treatment of containers which have contained substances known to be soluble in water.

Flush thoroughly with water several times and fill with water as far as work permits, positioning container so as to permit introduction of as much water as possible. Proceed with repair work.

For example, an acid drum may be handled in this manner and the hazard of hydrogen production by the action of the acid on the metal eliminated. Care must be taken to remove all traces of acid since dilute acid frequently produces hydrogen when concentrated acid will not in contact with the same metal.

II. Treatment of containers of previously known content which is not water-soluble.

The most important class or type of container includes gasoline tank trucks, gasoline ground tanks up to 2,000 gallons, domestic heating fuel-oil tanks up to 2,000 gallons, and similar containers that have contained oil or gasoline. These comparatively small containers can be readily treated with steam or a cleansing agent and filled with inert gas and repaired by exterior operations.

It is recommended that the inert-gas method, herein described, be used in all cases, even when the containers have been steamed or treated with hot chemical solution previously. The presence of inert gas in sufficient quantity will prevent ignition or explosion of vapors driven out of seams and joints upon the application of heat and not removable completely by steam or chemicals. This treatment supplements, rather than supplants, existing methods such as steaming or treatment with hot chemical solution.

*General Precautions.**—If the nature of the substance previously held by the container is not known, it must be assumed to be flammable and insoluble in water.

(*A*) Cleaning should preferably be done in the open, if in a building the room should be well ventilated so that flammable vapors will be quickly and safely carried away.

(NOTE: The vapors of most flammable liquids are heavier than air and tend to collect on the floor, in pits or other low spots unless adequate ventilation is provided.)

(*B*) All sources of ignition, such as open flames, unapproved light or power switches and unguarded electric lights, should be removed from the vicinity of the container, or rendered inoperative.

(*C*) The container should be emptied and drained thoroughly to remove as much of the content as possible. Removal of sludge and sediment may be facilitated by scraping or, in some cases, by rotating the container with a brass chain used as a scrubber. Hammering with a *wooden* mallet may help to loosen scale. Iron or steel chisels, scrapers or hammers should not be used because of the danger of sparks igniting flammable vapors. The residue should be immediately disposed of so it will not increase the hazard of the work.

(*D*) Containers divided into two or more compartments should have each compartment treated in the same manner regardless of what portion of the container is to be subjected to the welding or cutting process.

(*E*) Welding of containers should be attempted only by experienced welders, and under the direct supervision of some person familiar with the explosive characteristics of the contents.

(*F*) When welding or cutting, keep the head and arms away from the head of the drum as far as possible. Repair leaks on the sides of the drum before repairing the head.

Approved Method of Inert-Gas Treatment

The following procedure is applicable to all containers to which *these recommendations* apply *except* those having contained nitrocellulose or other pyroxilin plastics, aluminum or magnesium powders, carbon bisulfide, or materials which may decompose and release combustion-supporting agents and thus render inert-gas protection ineffective.

Permissible gases include carbon dioxide and nitrogen. Carbon dioxide is generally available; it is heavier than air and will tend to remain in the containers during the welding or cutting operation.

Nitrogen, when available, is satisfactory. It is applied in the same way as carbon dioxide supplied in cylinders, but the volume used must be at least 10% more than the volume of carbon dioxide specified herein.

Procedure.—(*A*) Close all openings, with exception of drain and vent. Damp asbestos, wood flour, adhesive tape or friction tape or similar material may be used for plugging cracks or other damaged sections.

(*B*) Fill container with water to overflowing and flush thoroughly, preferably admitting water through the drain. If no drain is provided, flush by running hose through vent to bottom of tank to secure agitation from bottom upward.

(*C*) Position tank when possible so that portion to be worked on is uppermost.

*Supplemental references: (1) "Handling, Cleaning and Filling Drums and Barrels," Industrial Safety Series—Petroleum No. 8—published by the National Safety Council, 20 North Wacker Drive, Chicago, Ill. (2) "Removing Flammable Vapors from Service Station Gasoline Storage Tanks," Industrial Data Sheet D—Petroleum No. 1—published by the National Safety Council. (3) "Regulations of the National Board of Fire Underwriters for Carbon Dioxide Fire Extinguishing Systems and Inert Gas for Fire and Explosive Prevention" as recommended by the National Fire Protection Association, 85 John Street, New York, N. Y.

rtain Types of Containers

(*D*) Drain off water, allowing as much as welding or cutting work permits to remain in the container and thus reduce volume of inert gas required.

(*E*) Introduce a sufficient quantity of carbon dioxide into the container to produce a concentration of not less than 50% by volume. This will usually require the introduction of a volume of inert gas at least as great as the volume of the gas space in the container, since the inert gas may tend to flow directly out of the vent after displacing only part of the previously contained gases or vapors. In purging with carbon dioxide, it is recommended where possible and the strength of container permits that the inert gas be introduced to raise the pressure in container to 10 or 15 lb. per sq. in. Release of pressure from the container will promote turbulence and thorough ventilation.

(NOTE: When the carbon-dioxide content is not less than 50% any mixture, regardless of ratio of flammable vapor to air, will be non-flammable and non-explosive, unless the flammable vapor is principally hydrogen or carbon monoxide, in which case a minimum of 80% carbon-dioxide content is required.)

It is permissible to use carbon-dioxide gas compressed into cylinders or solidified carbon dioxide, commonly called "dry ice," handled commercially in cakes 10x10x10 in., weighing 50 lb.

1. Introduction of carbon-dioxide gas from cylinders. When a large volume of carbon dioxide is required, the rate of withdrawal of the gas from the cylinder can be increased without freezing the cylinder valve by inverting the cylinder. If nitrogen is used, cylinders should be used upright.

(*a*) Introduce carbon dioxide into container at low pressure, preferably replacing water (see Fig. 1). As water leaves drain, introduce equal volume of carbon dioxide through vent.

(NOTE: Calculate volume of container and introduce at least equal volume of carbon dioxide. To estimate volume of carbon dioxide withdrawn from cylinder, weight cylinder before and after withdrawing gas and calculate volume withdrawn on basis of 8.5 cu. ft. per lb. If nitrogen is used, estimate volume withdrawn from cylinder by weighing cylinder before and after withdrawing gas and calculate volume withdrawn on basis of 13.7 cu. ft. per lb.)

(*b*) Where vent and drain are not present, introduce carbon dioxide through hose with outlet at bottom of tank so that heavier carbon dioxide forces other gases above it out of vent.

2. Introduction of carbon dioxide as solid.

(*a*) Crush the solid and shovel sufficient into container to produce volume of carbon-dioxide gas to fill gas space. The solid should be scattered over the bottom in a thin layer to secure rapid evaporation.

(NOTE: 1 lb. solid carbon dioxide will vaporize to 8.7 cu. ft. of carbon-dioxide gas at 70° F. at atmospheric pressure. Introduce sufficent weight of solid carbon dioxide to provide volume of gas at least equal to calculated volume of container.)

(*F*) Determine whether sufficient carbon dioxide is present in container by taking samples from bottom and top of container and analyzing or testing all samples for explosibility.

1. Analyze samples chemically for carbon dioxide by means of Orsat or other approved gas-analysis apparatus. Concentration of carbon dioxide found should be not less than 50% by volume in every sample.

2. At safe distance from container, test the sample for flammability by releasing small volume and exposing to flame. If the sample does not ignite or flash back, the container may be considered vapor-free and safe for welding and for cutting operations.

(NOTE: The Larner gas-sampling device is recommended. See Fig. 2 and Appendix A for directions for sampling and testing operations.)

(*G*) Take steps to maintain high carbon-dioxide concentration.

1. If carbon dioxide is supplied from cylinders, continue to pass the gas at low pressure into container during welding or cutting operation.

2. If carbon dioxide is supplied in solid form, dump excess solid into container, where it will vaporize during welding or cutting operation.

(NOTE: Avoid bodily contact with solid carbon dioxide. It will produce "burns." Avoid breathing large amounts of carbon dioxide. Do not tightly close a vessel which contains solid carbon dioxide as such will produce pressure.)

(*H*) Proceed with welding or cutting operation or other hot repair work.

Hot-Chemical-Solution Method

The chemicals generally used in this method are compounds of sodium silicate or tri-sodium phosphate (strong washing powder) dissolved in water to a concentration of from 2 to 4 ounces of chemical per gallon of fresh water.

(*A*) Close all openings in container, with exception of drain and filling connection or vent. Damp asbestos, wood flour or similar material may be used for sealing cracks or other damaged sections to be repaired.

(*B*) Fill container with water to overflowing, and flush thoroughly, preferably admitting water through the drain connection. If no drain is provided, flush by entering hose through filling connection or vent and lead to bottom of container to secure agitation from bottom upward, thus causing any remaining liquid, scum or sludge in the container to be carried upward and discharged by overflowing.

(*C*) Thoroughly drain container.

(*D*) Completely dissolved the amount of chemical required by size of container in small quantities of boiling water and pour into the container. Then fill container with fresh water.

(*E*) Make steam connection to the container either through drain connection or by pipe entering through filling connection or vent and leading to bottom of container. Admit steam into the chemical solution and maintain solution at a temperature of 170° to 190° F. At intervals during the steaming, add sufficient water to allow discharge by overflowing any volatile liquid, scum or sludge, that may have collected at the top. Continue steaming until no appreciable amount of volatile liquid, scum or sludge appears at the top of the container.

(*F*) Drain container.

(*G*) After draining, the container should be safe for welding, or performing any hot mechanical work, but as a matter of precaution, a sample of gas from the container should be obtained and tested, using gas-sampler apparatus described in this report or other suitable equipment.

(*H*) If steaming facilities for heating the chemical solution are not available, a less effective method is the use of a cold-water solution with the amount of cleansing compound increased to about 6 ounces per gallon of water.

(*I*) In performing cleaning operations by this method, personnel should guard against injury from steam or caustic cleansing compound. Workmen should provide themselves with suitable goggles, gloves and other protective coverings.

Steaming Method

(*A*) Prior to steaming, fill the container at least 25% full with hot soda or soda-ash solution (1 lb. of caustic to a gallon of water), and agitate it sufficiently to insure that the interior surfaces are thoroughly flushed.

(*B*) Thoroughly drain the container.

(*C*) Close all openings in the container, with the exception of drain and filling connection or vent. Damp asbestos, wood flour or similar material may

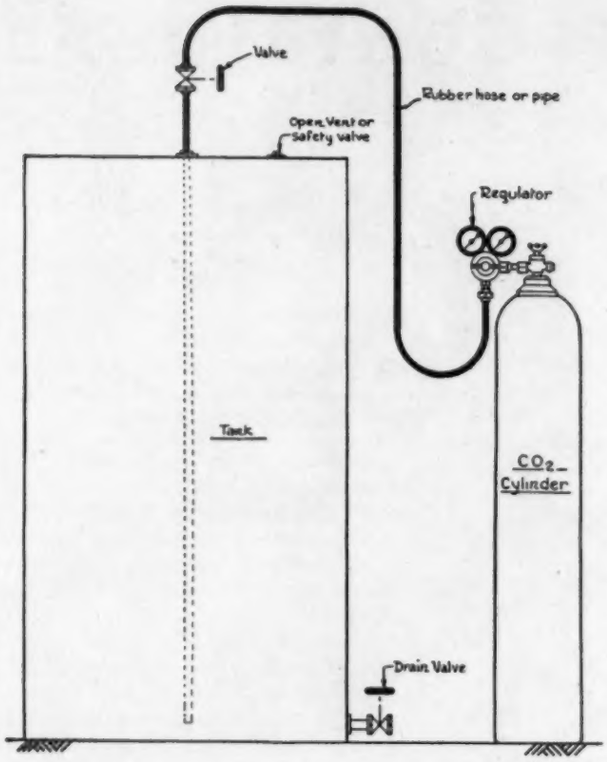


Fig. 1. Showing Method of Connecting Cylinder for Discharging Carbon Dioxide into Tank.

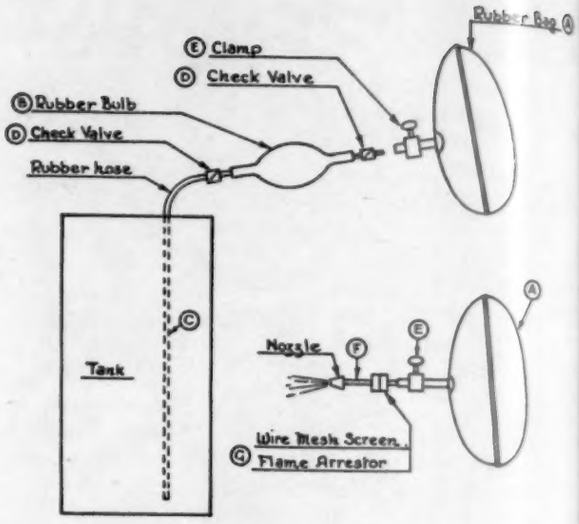


Fig. 2. Apparatus for Obtaining and Testing Samples of Flammable or Explosive Gases.

be used for sealing cracks or other damaged sections to be repaired.

(*D*) Blow live steam into the container (through drain, preferably, or any accessible opening) for a period of time to be governed by the condition or nature of the flammable substance previously contained. Do not steam a container with only one opening.

(NOTE: When steam or hot water is used to clean a container the operator should wear suitable clothing, such as boots, hood, etc., to protect himself against burns.)

1. Low-pressure steam should be used. The steam line into the container should be steam hose of not less than ¾ in. in diameter, without nozzle or valve at the outlet end. The steam pressure shall be controlled by a valve ahead of the hose.

(NOTE: If metal nozzle is used, it should be of nonsparking material. It should also be electrically grounded to the container and the container should be grounded to prevent static-electricity accumulation.)

2. The time of steaming should be continued until the container is free from odors and the metal parts of the container are hot enough to permit steam vapors to flow freely out of the container vent or similar opening. It is inadvisable to set a definite time for steaming containers, even of specific size, as weather conditions, such as rain or extreme cold, may condense the steam vapor as fast as it is introduced. It may take several hours to heat up the container to such a temperature that steam vapor will flow freely from the outlet of the tank.

(*E*) Thoroughly flush the inside of the container with boiling water and drain.

(*F*) Inspect the inside of the container to determine that it is clean. This may be done by using a mirror to reflect light into the vessel. If examination shows that the container is not clean, it should again be steamed and flushed with hot water.

(NOTE: Light source should be an electric lantern or flashlight approved for hazardous locations.)

(*G*) Inspect the container to determine if it is gas free. This test preferably should be made by means of a suitable gas detector. If unavailable, take a sample of the gas from the container with the Larner Gas Sampler as described herein, and test it for flammability. If the gas does not ignite or flash back, the container may be considered as gas-free and safe for welding and/or cutting operations.

(*H*) Before welding or cutting operations are started, position the container so that the portion to be worked on is topmost, and fill as full of water as the welding or cutting work permits.

APPENDIX "A"

Gas Sampler

Description of necessary material, operation of and test of flammable and explosive gases with gas-sampler apparatus.

Material Required:

(*a*) Football bladder or small rubber bag.

(*b*) Rubber-bulb pump (hand-squeeze type).

(*c*) Ball-type check valves (rubber-tube type, 2 necessary).

(NOTE: A rubber syringe equipped with check valves can usually be procured at any drug store. This will serve the purpose of the rubber-bulb pump and will eliminate the check valves as separate items.)

(*d*) Rubber tubing (¼ to ⅜ in. internal diameter).

(*e*) Rubber-tubing clamp.

(*f*) Nozzle (metal construction, similar to glass-tube eye dropper).

(*g*) Wire-mesh flame arrester (100-mesh wire cloth, 0.0045-in. wire diameter, 0.0055-in. openings).

Operation of Gas Sampler

1. Install check valves in rubber bulb (*B*) so that one valve allows air to suck into bulb and the other valve allows air to discharge from the bulb when the bulb is operated by squeezing and releasing with the hand. Connect the suction end of rubber bulb (*B*) to rubber tubing (*C*).

2. Lower free end of rubber tubing (*C*) into container to the level at which the sample of gas is desired.

3. Operate rubber-bulb pump (*B*) (squeeze and release by hand) a sufficient number of times to insure that all entrapped air is discharged and that these parts of the sampler apparatus are completely filled with gas representative of that in container.

4. Thoroughly deflate rubber bladder (*A*) and connect the filling tube of same to the discharge end of the rubber-bulb pump (*B*).

5. Operate rubber-bulb pump (*B*) to fill and expand rubber bladder (*A*) to

a pressure sufficient to conduct test of the gas.

6. Seal rubber bladder (*A*) with clamp (*E*) and disconnect same from other parts of the sampler apparatus.

7. Connect nozzle (*F*) and flame arrester (*G*) to rubber bladder (*A*).

Test of the Gas

At safe distance from the container, apply flame of match, candle or torch to the tip of nozzle (*F*), and simultaneously release clamp (*E*), allowing gas to flow from the tip of the nozzle. If the flow of gas from the nozzle has a tendency to deflect or blow out the flame, the gas may be considered to be non-flammable and non-explosive and the contents of gas in the container sufficiently safe for accomplishing welding or other hot mechanical work.

If, however, the flow of gas from the nozzle has a tendency to ignite, or flash-back explosions occur, it *must* be considered that the gas content of the container is flammable, explosive and *unsafe* for performing any welding or other hot mechanical work on the container.

Hydraulic Presses Have Welded High-Pressure Pipes

The welding of all joints in the pipe of a 750-ton hydraulic press was recently completed by the Moline Welding Service, Moline, Ill. The pipe and fittings on this press were of the threaded type, and leaks developed first at one place and then at another, always in the joints. After exhausting all other means of making these joints permanently tight, it was decided to weld them. The welded joints came up to expectations, and no further leaks have developed.

A 500-ton hydraulic press is now being built by the Williams & Whyte Co., of Moline, and all piping carrying high pressures will be welded by the Moline Welding Service, in order to eliminate trouble and obtain a high-quality job.

Diversified Program for Los Angeles Meeting

The April 18th meeting of the Los Angeles section of the American Welding Society is scheduled to be held at the Rosslyn Hotel, 111 W. Fifth St. The program as planned will comprise three special features, as follows:

P. D. McElfish, material engineer for the Standard Oil Co. of California, will present a paper on "Development, Manufacture and Welding of Some Corrosion-Resisting Materials." R. V. Edwards, sales manager for the American Concrete & Steel Pipe Co., Los Angeles, will give a talk on the fabrication and installation of the Little Morengo Siphon for the Metropolitan Water District. This siphon is 144 in. in diameter and is made of precast concrete, reinforced with welded steel. The talk will be illustrated with motion pictures. J. J. Burton, service engineer for The Linde Air Products Co., will present a motion picture describing the operation and uses of the muti-flame Lindewelding head.

Get "*H. O. T.*" on Welding

■ By H. OT. RIDLON

[This section is dedicated to Better Welding and Better Welding Shops. Suggestions and criticisms are invited.]

Our Botany Lesson Today Teaches Us This—

You may not know it, rear reader, that the leiianthus picadorus, otherwise known as the common crocus, and the keliosynthus morphoditis, called in the vernacular the daffy-down-dilly, are at this moment arising from their beds in the sleepy bogs of this here swell country of ours. Or, if you do know it, you may not be palpitantly or even perceptibly tintillated by the knowledge. It may leave you, as the saying goes, cold.

It happens, however, that this year and this April, the systolic convulsion of nature is symbolic of a rising tide in the affairs of men—a revival of business, to put it bluntly, that should interest even the least of us. The welding industry, and that of course means all of us, has always been an unusually good gauge of business conditions. We feel depressions, it has been observed, last. So that, when the tide is about to turn, you can pretty safely turn in the direction of the welding industry for a sure, accurate sounding.

Ladies and gentlemen, that sounding has been made, and the report is, we're on the up-and-up. Just what day, hour and month the upturn will be so considerable as to be generally recognizable is one of those secrets which Providence elects to keep to itself. But, soothsayer though we be not, we positively *know* those crocuses and daffodils mean a lot of good to all of us.

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Hot Sparks

Being the earliest settlers in the community (*coming across* early on the first of the month), is more important than how many of your ancestors *came across* on the Mayflower a couple of hundred years ago.

And whatever got us into this Depression? The *buck fever*, yea, verily!

Never tell your troubles to even your closest friends. They probably have a wife and relatives of their own.

I'm for the new deal, all right, but there are times when I like to cut the cards first.

When columnists do restive grow, they then do bend the festive elbow, which means that every clever "think" is inspired by a potent drink.

The price of a thing may not be its value, and we can pay for it in much that is not money.

It is not the amount of labor, but skill at labor which is the reward of services rendered. Money always is an effect, evidence of the past efforts of someone—preferably of the person who has it.

Study values, not prices only.

It is not our troubles that matter so much, but just how we face them that really counts.

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Oddities in the Industry

Some time ago I was talking to the Superintendent of Maintenance of Way of a certain railroad who didn't know aluminum could be welded.

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Intimate News of the Industry

Yes, gents, young Jimmy Burlincourt of Fort Wayne, Ind., really knows how to handle a cutting torch, but methinks that if you'll be asking him, if it is wise to bet with the Old Maestro on a cutting test he'll be after telling you *no*. When you see him, get him to let you in on the low-down. He's a fine, honest and upright lad, and will be sure to tell you the truth.

I hear that another old timer in the industry is about to change jobs again. It is not official yet, but it looks like he is going to make that change. Some firms sure have all the breaks. When the news is made public, I wish to be among the first to extend my "congrats" to all those concerned.

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The thought for the month: To get more, get more of what it takes to get more.

A Complete Unit for Field Welding, Fabricated Entirely With the Arc.

Uses Welding to Construct Portable Welding Unit

A recently completed portable welding outfit speaks well for the ingenuity of the welder, who appears in the picture, in which the welding unit is also shown. The entire outfit is arc welded with Hollup 30-S welding wire, all base boards, rear fenders, cable reel and protective parts being welded in place on the chassis.

Provision is made, over the rear wheels, for the storage of rods and materials used in the field, and the acetylene and oxygen tank can be seen in place to the left of the welder, where they are perched in frames welded to the running board. A spring on the reel holding the welding cable assures prompt replacement of the cable after use, and permits the cable to be reeled in rapidly, or it can be brought in by turning the handle located at one end of the reel.

The unit is very compact and is exceptionally light in weight. This outfit is now in service with one of the largest gas companies in the East.

Le Tourneau to Erect All-Welded Factory

An extensive expansion program is under way at the plant of Robert Le Tourneau Co., manufacturers of a large line of heavy all-welded earth-moving equipment, in Stockton, Calif. This concern has under construction an all-electrically-welded steel building 80 ft. wide by 340 ft. long, which addition will materially increase the capacity and efficiency of the present plant, which is now housed in another building 60 ft. by 300 ft.

The new building will be equipped with specially designed heat-treating furnaces, together with modern machinery for fabricating the many Le Tourneau earth-moving units, which are famous for their ruggedness and large capacities—made so largely by their all-welded construction, which method of fabrication has been religiously adhered to by Mr. Le Tourneau throughout his many years of work in this field.

Takes His Profits Both Day and Night

By W. B. SHERRILL

Arranging his working hours to suit the convenience of his customers has proved to be a very profitable scheme for Virgil S. Gribble, head of the Gribble & Spratt Welding Co., 1231 Santa Fe Drive, Denver, Colo.

Finding that an occasional trucking operator wanted a welding job done at night after his truck got in from a run, Mr. Gribble began to work towards developing this phase of his business, with the thought that if one or two truckers needed welding attention at night after his regular hours at the shop, then undoubtedly there were many others of the considerably more than a hundred operators who would appreciate the same service.

As his first step towards developing this business, Mr. Gribble instituted a telephone campaign, calling personally every trucking and transportation firm listed in the business directory of his local 'phone book. Getting the manager on the line, he informed him that, from that date on, the Gribble & Spratt Welding Co. would offer an emergency welding service to anybody who needed it. This telephonic advertising resulted in several jobs immediately.

Then, as his shop was furnished with a portable outfit, he began to develop this end of his business. Several of the largest institutions and establishments in Denver were solicited and sold his services. Their building-maintenance and operation superintendents were apprised of Mr. Gribble's portable welding service and started to use it on emergencies when time was the costliest of all considerations. Today, as a result of his prompt and efficient attendance to the welding needs of these several-million-dollar firms, he has their entire welding needs coming into his shop or being handled with his portable outfit.

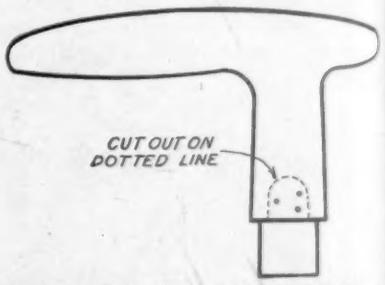
To more completely occupy the time of his day force, Mr. Gribble then started an active solicitation among used-car dealers and garages that weren't equipped with welding outfits. By periodical contact with them he began to get an occasional bit of radiator, fender or body work from them. As his constant solicitation, either by 'phone or in person, began to further acquaint his shop with auto row, his business in this particular phase of welding greatly increased.

Preheating White Metal for Welding

There is a saying among the welding fraternity that the kind of job that will next be brought into the shop is as uncertain as the direction in which a dill pickle will squirt. Also, these uncertain jobs demand ingenuity to the nth degree.

So it was with Ray Studer, proprietor of Ray's Welding Shop, Massillon, Ohio, when one day a customer brought in a small but complicated white-metal casting broken in four places. Now, Mr. Studer, who has specialized in white-metal welding for several years, states that this metal has more expansion upon heating than any other metal with which he is familiar, and that it heats and cools rapidly and melts at very low temperatures.

This casting offered no serious problem as regards the mechanism of welding, but



Method of Cutting Out and Welding to Repair Loose Automobile Door Handles.

how to preheat it was a question not easy to answer, since ordinary means of preheating would burn the metal. The problem was solved by using a ½-in. steel plate as a base, set over a preheating burner, with the flame playing directly on the underside of the plate. After the plate had warmed up considerably, the casting was laid on top. By bringing the plate just to red heat, sufficient heat was passed into the casting to preheat it to the right temperature, and the flame was then adjusted to maintain the steel plate at barely a red color.

With the casting properly preheated,

Mr. Studer quickly made all four welds, working as rapidly as possible. After the welding was finished, preheating was carried on long enough to thoroughly equalize the temperature in the casting, whereupon the preheating flame was turned off and the casting was covered with asbestos and allowed to cool down with the steel base plate. When thoroughly cool, the casting was dressed and delivered to the customer. It has been in service sufficiently long to prove the soundness of Mr. Studer's procedure.

Among the white-metal jobs Mr. Studer is called upon to do, there are many automobile-door handles, particularly Chevrolet handles. These handles have a steel center in which is located the lock. The white metal is cast around this steel core, and to function satisfactorily the casting must not turn on the core. Frequently these castings become loose on the steel and turn without turning the steel part containing the lock.

To repair these handles, Mr. Studer chips away the casting along the dotted line shown in the accompanying diagram. The casting is cut away entirely down to the steel core. Then, by the arc-welding process, a small bead or drop of steel is applied at about three different places on the steel core, and these form projections on the core. Then the section chipped out is gas-welded back in place, care being taken to work the weld in closely around the drops and make good fusion with the casting. A white-metal welding rod is used for filler. When cold, the weld is dressed off.

The three drops of weld metal on the steel core protrude into the white metal and act as lugs, thereby preventing the casting from turning on the core. A handle repaired this way is the equal of a new handle, and the saving in price is attractive. The same procedure is used when the handle is broken in the region of the steel section.

Chicago Section to Hold Railroad Meeting

The railroad men will have their day at the meeting of the Chicago section of the American Welding Society, to be held in the Hamilton Club, 20 S. Dearborn St., on Friday evening, April 26th. The meeting, which will begin at 7:30 p. m., will be preceded by a dinner at 6:15. The Nominating Committee will give their report at this meeting.

The program of papers is as follows: "Butt Welding of Railroad Tracks," by J. B. Tinnon, sales manager, Metal & Thermit Corp., New York; "Railroad Reclamation by Welding," by R. G. Mason, foreman of welding, A. T. & S. F. R. R.; "Railroad Welding," by S. E. Tracy, C. B. & Q. R. R.

A Welding Engineer's Wife Speaks Her Mind

■ By ONE OF 'EM

Talking Arcs

Early in February our home was port-of-call for a shipyard welding supervisor from Panama, Canal Zone. Name is Walker Nagel, and he and my husband had a good time recalling some of their wartime navy experiences when both were checking fuel consumption in the hold of the *U.S.S. South Dakota*, convoying troop ships abroad. After the war they ran into each other again, this time in the hull division at the Philadelphia Navy Yard. Last week's meeting was the first reunion since that time and was made the occasion for exchanging a few choice narratives out of their welding pasts.

Mr. Nagel works at a shipyard where vessels are conditioned for passage through the Panama canal. One of the welders in the drydock was a fellow from the U. S. named Bill. Bill hailed from Brooklyn, N. Y., and there was a young lady there who had had hopes. Now a soft-eyed Panama charmer seemed to be cutting her out. The other fellows at the yards liked to heckle Bill about his fickleness with the fair sex. One night, with a few radio tubes and a microphone hooked into his arc line, they framed poor Bill.

He was out in the drydock next day, repairing the stern frame of the Japanese freighter *Sessue Maru*. There wasn't a soul within fifty feet of Bill, when suddenly a voice appeared out of nowhere and spoke his name. Then in shrill tones the voice asked if he was dating Lolita that evening. Bill slammed down the holder and tore around to the starboard side of the stern frame to see who was getting fresh. No one was in sight. Bill went back and started welding again. The voice sounded again, and this time it seemed to come from right in front of his shield! "Bill," he heard it say, "better not let Lolita see that picture of Mary you got tattooed on your wishbone. You might have to get something off your chest!" The voice stopped speaking and wound up in a hoarse cackle. This time Bill had to do something. He was desperate. He grabbed off his shield and climbed up out of the dock. He was sure it was the D. T.'s again, or maybe yellow fever had got him. He reported sick to his foreman and went home.

Bill had been the victim of a well-understood hoax. That is, his pals in the electrical department understood it. If Bill had known about the principle of the "talking arc", he would have saved himself considerable mental distress, to say nothing about half a day's pay. What the fellows had done was to hook the loud-speaking mechanism into a divided section of the arc circuit, so that the oscillations set up in the microphone circuit were reproduced in the arc circuit and appeared as sound waves in the oscillating arc.

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More Die by Athlete's Foot Than Bayonets

A recent Sunday caller at our house was Arthur Bergstrom, crack demonstrator. Mr. Bergstrom returned last August from South America, where he had spent eighteen months welding for Armco International Corp. His last stay had been at Sao Paulo, Brazil, and there he had acquired a strong liking for the universal beverage of the southern hemisphere—coffee. At the suggestion, I went out to the kitchen and brewed a pot of it. The first whiff of that old Rio fragrance brought back to "Bergy" many entertaining memories, and here are some.

It seems that he had seen some of the fighting on the Chaco (Paraguay-Bolivian border) and came away with the opinion that South American military methods have something to recommend them. This in spite of the fact that the fighting men are magnificently uniformed only down to the ankles, and that's where the feet begin! Big, dirty, bare feet, for down Chaco way, none o' God's chillun got shoes.

Fighting is business-like during the forenoon, but both sides knock off after lunch and are just buddies together until it is time to start scrapping again next morning. Then they are murderously hostile once more. What a war! A man could bring along his pipe and the crossword puzzle he was doing, and have a swell time being a patriot.

Mr. Bergstrom said that he had no difficulties with the language, because in every plant there was at least one English-speaking native. He found the people courteous but reserved. Climate was fine, with seasons reversed from ours. Cities large, modern, and enterprising. His favorite, Buenos Aires. Hotels excellent and cheap, but his hotel room in Sao Paulo had only a hammock to sleep in. But ah, the coffee!

As a hobby, Mr. Bergstrom collects uncut semi-precious stones, and he had with him a collection of fine aquamarines from the mines in the Andes mountains.

On one occasion he had to cross Brazil in a hurry to answer an emergency call. The plane leaked in a drenching downpour but the management had thoughtfully supplied umbrellas.

Need for Standard Table for Welding Lenses

By J. B. AMES

While attending a convention several years ago, I made the acquaintance of an expert welder who was demonstrating his skill with the torch. This man's knowledge and skill in connection with the behavior of metals under the torch created a great demand for his services in all parts of the country. When a short time before, a puzzling problem on the Boulder Dam project had been put up to him, he considered it only as "just another job."

During our discussion about welding, he handed me a pamphlet with the request that I read it to him, as his eyes, he said, were not very good. Gradually our discussion swung to eyes. Miserably, he admitted he was about through as a welder, on account of failing eyesight.

"Such weaknesses as we creatures have! Now that my knowledge is at its peak, I can't go on and reap the benefits of my labors. Eyes, eyes, eyes—I know I was too careless." Thus ran his lamentation. This man with good physique, unlimited energy, and high ambitions, had reached the pinnacle of his career—all because of bad or improper lenses.

Since that time, I have given a great deal of thought to my own eyes and to methods of helping the welder choose proper lenses for his work. Let us all, whether we are engineers in charge of welding jobs, foremen or operators, cooperate in setting up a standard table for welding lenses. Let's adopt the slogan, "Use the right rod in the right place and the proper lens in the proper place."

A common phrase is, "A weld is no better than the man who made it." It takes several years to make the man who makes the better welds. The welding industry cannot afford to lose the expert.

I've had many experiences with eye strain and "sand" in the eyes. At one place where I worked, the company furnished the welding goggles for its welders. To my dismay and discomfort, I found the lenses very dark and hard to see through. When I told the boss that the lenses were too dark, he investigated and found that the insurance company recommended No. 10 shade lens for oxyacetylene welding, so that was that. The insurance company no doubt acted in the best of faith in safeguarding against dangerous rays, but they overlooked the tremendous eyestrain that the improper lenses caused. It would be well if this insurance company would set up a clearing house for lenses by creating a welding shop of its own to carry on experimental and research work.

As a suggestion, I would recommend that the big concerns handling welding equipment and supplies, together with all those interested in the advancement of welding, get together to find out the best lens for the various jobs, then pass on their findings to their customers and welders.

No one lens will do for all oxyacetylene jobs, nor will any one lens do for all arc jobs. For oxyacetylene welding, I use four sets of good goggles—one very light for light silver soldering, a No. 5 for cutting, a No. 6 for ordinary welding, and a darker pair for heavy cast-iron welding on account of the brilliant flux glare. For electric-arc welding, I use No. 10 for light bare wire, No. 12 for ordinary welding, and No. 14 for heavy carbon.

It is well to remember that the operator needs a darker shade of lens when welding in bright, glaring sunshine than when welding in the darkness of night or in a tunnel.

The welder needs a light place in which to work, as much as a lathe hand does. And, above all, he must have good ventilation. A roaring No. 12 or No. 15 tip in a small, closed room will burn up almost all the oxygen and leave nothing but bad fumes for the welder to breathe.

Grinder Welded Up From Scrap

An efficient bench-type grinder with two wheels was recently built by H. W. Hahn, welding-shop operator, at 16½ Market St., Tiffin, Ohio, during his spare time. On a base plate, 6x9 in., Mr. Hahn welded two pieces of ¾-in. pipe, 7½ in. long, in an upright position. Two ¾-in. pipe nipples were welded crossways, extreme care being taken to make them in line with each other. These nipples were then fitted with high-speed babbitt for a ½-in. shaft, after which they were drilled and tapped on top for grease cups.

A V-type pulley was brazed to the shaft, the pulley having been obtained from an old automatic refrigerator unit. A 1/3-hp. electric motor carrying a V-type pulley on the end of its shaft, was mounted on the bench to the rear of the grinder, and operates the grinder at a speed of 2368 r.p.m. through a belt.

Each grinding wheel was provided with a safety guard fabricated from scrap material obtained around the shop. Each guard is adjustable to compensate for the wear of the wheel, and when located in its extreme position will allow for the use of a polishing wheel.

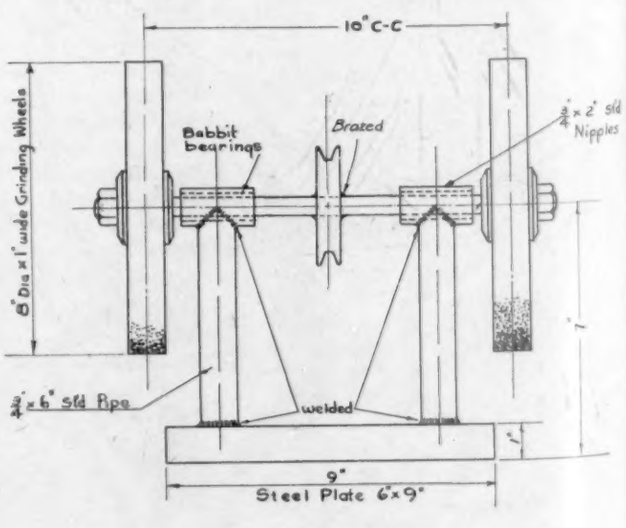


Diagram of Bench Grinder Built Up From Scrap Parts by Welding.

Plate Welders and Riveters Organize Association

Welders and others engaged in the erection of steelplate structures have organized the Independent Steel Tank & Plate Erectors Association, with a national office at 6417 Ingleside Ave., Chicago, Ill. S. C. McCloud is chairman of the Board of Directors, and Walter M. Oertlin is National Commissioner. Already the organization is supplying welders and riveters to many of the manufacturers and contractors engaged in plate fabrication, and is lending its services to assist unemployed workers to find jobs. The organization is made self-supporting through membership fees and monthly dues. Mr. Oertlin has had many years of experience as a welder and supervisor on plate work in both field and shop.

Shop Owner Turns Business Over to Employees

Herman Flader, manager of the National Welding Co., Denver, Colo., announces his retirement from active participation in the activities of his large establishment. His time, hereafter, he says, will be largely devoted to the further development of a new business that he has fostered—the manufacture and distribution of his patented hose-clamping device. The National Welding Co. will continue in business under the direction of the older employees, who will gradually acquire a minority interest in the business under a profit-sharing

arrangement that Mr. Flader has worked out for their benefit. This places the National Welding employees in a peculiarly fortunate position as "Flader of Denver" is known nationally and has, during his 23 years of welding activity, successfully repaired more power-plant and industrial jobs than perhaps any other man in the country. The high standing of his company will naturally reflect to the financial benefit of the employees.

Ruppe Picks His Profits Off the Junk Pile

By JACK WILTON

By making table lamps, welded metal furniture in modern designs, small forges, metal handles for garden tools, automobile trailers, and many other items, E. Ruppe, welder at Albuquerque, N. M., converts his spare moments into extra profits. About 50 per cent of his total business is done on sidelines.

"If I get enough job-welding business to take care of my regular expenses, I'm 'sitting pretty'," says Ruppe. "The sideline work means clear profit. On a lot of these items, I can make several hundred per cent profit. I'm convinced that the average small welder must figure out some sideline activity. In districts such as this where there is little industrial work and even small jobs are few and far between, a steady income isn't possible from service alone. But, the welder *can turn his experience and ingenuity* into profitable channels."

The welded lamps are probably the most unusual sidelines the Albuquerque welder has turned out. The finished products are sold by a local woman to large department stores all over the country. Some idea of the volume available may be had from the fact that a single week's order of welded frames amounted to $28.

Covered with goatskin put on while wet and allowed to dry and contract, the lamp frames had to be very strong. Wood, wire and many other materials were tried without success. The drum-tight goatskin would crush all of these like an eggshell. Ruppe suggested 3/16-in. welding rod held with bronze weld. Excellent results have been obtained in this way. Not a single break has occurred in several hundred lamps put out to date.

The goatskin coverings are painted in Indian designs—carrying out the New Mexico atmosphere. Novelty items have also been produced in similar design—for instance, an Indian tepee with a doll inside to represent the occupant. The frame here was also made of welding rod, five sections of it being welded togethere in a bunch at the top and the other ends held out in position with a rounded frame. An important point is the size of rod. Anything smaller than 3/16-in. will be crushed by the skin.

One of the reasons Ruppe can make so much profit on the articles he makes himself is that he uses almost nothing but junk. For instance, he had made a great deal of beautiful furniture, in modern lines, out of bedsteads recovered from the junk pile after a fire and from strips of iron formerly used in road-sign stakes. One set of furniture, including table and two benches, brought $37; the only investment was a few hours of time and a little paint.

The designs are simple. The sign metal is bent into an oval shape to form the top and the two ends welded together. The normal shape of the metal —it is bent in the middle—leaves a good edge for setting in a wooden table top of any desired type.

Legs are simply two old pieces of bedstead bent around with the two ends being welded to the top at either side and the rounded bottom resting on the floor. Chairs are equally simple. A trip to any furniture department will yield plenty of design ideas.

The chairs can be provided with wooden seats or they can be upholstered at a reasonable cost if the buyer desires this. The paint job is in silver or aluminum with a black stripe—carrying out the modern design. Ruppe is planning to install an electro-plating outfit so he can give furniture an even more "classy" finish.

Numbers of small forges, made entirely out of junk, have been sold. The tops are old automobile wheels covered with metal. The legs are pipe sections which screw into joints welded onto the bottom of the wheel. This feature makes it possible to dismantle the forge and carry it around in a very small space.

Two Model T Ford brake drums, a Model T armature and a small electric motor comprise the blower, which is welded onto the wheel. Plates of metal are set into each of the armature slots and the armature fitted inside the brake drums, which are welded together. When the motor is turned on, the armature turns and the metal strips serve as fan blades.

Many metal garden tool handles have been sold both to small city gardeners and farmers. A single handle serves for a complete set of tools. It is made of a piece of 1-in. pipe with a cross piece welded across the top for a grip. Onto the metal shaft of each tool—the one that ordinarily runs up into the wooden handle—is welded a metal collar, threaded to fit the threads on the handle. The handle and installations of the collars are sold together at a flat price.

Also, Ruppe has built up a lot of farm business in rebuilding small gasoline motors and saw mandrels. The worthless equipment is picked up off the dump or bought for practically nothing, and with some welding work and a little other fixing up, made thoroughly serviceable and saleable for a good price.

Trailer construction has proved highly profitable. The average small trailer costs Ruppe about $5 and he sells it for $25. Usually he doesn't include wheels and tires, but when the units are equipped with these, he can still clear $17.50. Scrap metal and discarded wood are the only materials needed. The bodies are made extra desirable because of added strength given through welding. Not a bolt is used—everything is welded.

Camping being very popular in this region, the Albuquerque welder is now getting into large house trailers designed to sell for $75. One completely inclosed job now on display weighs only 625 lb., including a heavy steel bed. The body frame is made entirely of welded tubes and angle iron, giving strength but avoiding costly weight.

Sales costs don't amount to anything. All these articles are sold entirely through a conspicuous display on a vacant lot. The big trailer is displayed mainly to get inquiries; it is a sort of model from which people may plan and work out their own specifications.

Practically all these items are adaptable to individual needs. He can get attention by showing a sample, and then can make up the finished profit just the way the customer wants it.

The variety of articles to be made out of junk by an experienced welder is unlimited, according to Ruppe. He plans new things constantly and always has a dozen things ready to start working on as soon as time is available.

Sound-on-Film Motion Picture on Welding

In connection with the presentation of the play "Profits of Progress" in Pittsburgh, Pa., last fall, The International Acetylene Association produced a new one-reel sound-on-film motion picture on the applications of the oxyacetylene processes of welding and cutting. This picture discusses the processes in general and covers their application to repair and maintenance, construction work, repetitive production, demolition and precision cutting. It is made up of photographic sequences taken from films furnished by several members of the Association.

The film was produced as a standard 35-mm. sound-on-film picture. It is,

however, possible to reduce this film optically to 16-mm. film, which film in 16-mm. form is approximately 400 ft. long.

Members of the Association and others are being given an opportunity to purchase 16-mm. copies of this film. The cost will be approximately $25 and orders should be sent direct to Secretary H. F. Reinhard, 30 East 42nd St., New York, N. Y. Purchasers should bear in mind that the film can be projected on any standard 16-mm. sound-on-film projector such as those made by Bell and Howell, Victor, Ampro, RCA and others, but if projected without sound, the film is lacking in that it has no printed captions. The picture cannot be shown with silent projectors.

Plants Need $1,300,000 in Welding Equipment

In an effort to determine the extent of the pent-up needs for new equipment, the Machinery and Allied Products Institute, 221 N. LaSalle St., Chicago, Ill., recently conducted a survey among its members, constituting manufacturers of light and heavy equipment, to see what their needs were in new equipment for replacing obsolescent and broken-down machines and for additions to their present plant.

The results, just issued in pamphlet form, show that these companies need today a total of $45,377,402 in new equipment, which they say they would be in the market for, assuming a "sound governmental policy and restored confidence." Of this total, the survey shows that approximately $1,300,000, or 2.88%, would be spent for welding equipment alone.

Welding New Airflow Hoods Into Last Year's Cars

By R. B. HUTCHISON

A new phase of the welding industry has brought 20 jobs and kept four men busy during February for the United Coach Co., 1616 Grand Ave., Kansas City, Mo. This work is in welding 1935 Airflow hoods onto 1934 Chrysler-built Airflow cars. This business has been secured through the local dealers and the Chrysler district agency. The factory supplies the stamping for the hood, and separate stamping for the louvre. They also supply the chromium-plated radiator grill and mouldings.

The old hood is removed from the car and the top cut out of it across the top of the radiator louvre in front down the length of each side and across the back so as to leave of the old hood only a frame, about 3 in. across. The old louvre is removed. Then the stamping of the 1935 peaked dallion is welded onto the frame that remains of the old hood. The new louvre is welded in. Welds are then all leaded over and burnished out smooth. Only arc welding is used, since it does not burn the alloy used in the metal cap or dallion.

The hood is then painted in the company's shop to match the car. Finally, the chromium grill and mouldings are attached, and the owner has what looks like a 1935 Airflow.

Doing Shop Work Outdoors Attracts Attention

There's no better advertisement than the light from a welding outfit, according to H. Maurino, manager of the General Welding Co., Albuquerque, N. M. He takes advantage of that fact by doing the greater part of his work out in the open in front of the shop. Having two portable outfits mounted on trucks, this is possible except in bad weather.

"It would be more convenient for us to work in the shop, but the attention to be attracted by working outside makes the extra trouble mighty well worth while," says Maurino. "This is particularly true at night when the light reflects on nearby buildings and even on the clouds if they are hanging low. Because of the attention value, we do many jobs at night that could be handled in the daytime.

"We never do an evening's work but what several dozen cars drive out from the business district to see what the light is. Many look for a fire.

"It might seem that we wouldn't get direct returns from this—but we do. I can recall, offhand, several cases where customers told us they were attracted to the place and remembered it when they needed welding service."

The shop's portable equipment has been a big asset in handling out-of-town business. The territory within 100 miles around is served regularly and trips have been made to points as much as 225 miles distant.

Builds Three 106-ft. Towers by Welding

Branching out into the boiler-welding line, Camp & Luthy Welders, Inc., 1920 Baltimore St., Kansas City, Mo., recently completed the erection and arc welding of three steel towers for making carbonic acid gas at the plant of the Liquid Carbonic Co. in Kansas City.

The towers are 8 ft. in diameter and stand 106 ft. high. They are made of steel sheets rolled to form one-half the tank so that there are two welds the length of each side.

No rivets are used in the job, all joining being done by welding. Plates of the tower were held in place during the welding by bolts which were removed on the completion of the work.

Ten men worked two weeks on the towers. Three gasoline driven portable outfits were used during the entire job, each consuming about nine gallons of gas per day.

Making Torch Extension to Weld Preheating Jobs

By M. L. ROGERS

To make an extension to your welding torch for welding a preheating job, take a piece of copper tubing, not over 3/16 in. inside diameter and of the length you desire to extend your torch, and swedge down one end on a V-block with a very light hammer. By placing a ⅛-in. welding rod in the end, swedging is made easier. If you want a tip end smaller than ⅛ in., swedge down and then drill out to the desired size. The end can then be bent to form a goose-neck to whatever angle you desire.

To connect the tube to the torch, drill a large opening in one of your burned-up tips and braze the tip to the copper tube.

If properly made, the torch will throw a very nice flame and will stand a remarkably great amount of heat. Particular care must be used in making the tip end, otherwise the welding flame is likely to be ragged.

Holds Casting Together With Bolts During Welding

A neat job of welding was recently done on a cast iron furnace dome from the hotwater heating unit of a six-story apartment house, by Earl Dollison, owner of the Dollison Welding Shop, 512 East 18th St., Kansas City, Mo.

The casting was 5 ft. in diameter and 2 ft. deep, weighing 500 lb. In addition to some 10 ft. of cracks around the side of the casting, a piece 16 in. in diameter on the top had warped and bulged. This was knocked out in pieces with a sledge hammer and then these were chamfered, preheated, fitted together and welded back into one piece. The casting was drilled and clamps were bolted in to hold the cracks closed. It was then preheated to a cherry red by natural gas with an air booster.

Some 11 ft. of welding was done with an oxyacetylene torch, using 1/4-in. cast-iron rod. The cracks were not chipped out, but were fluxed and cut away with the torch as they were being welded.

As the work progressed, the bolts were cut off the clamps and the holes welded up with the torch. The bolts that dropped inside were shaken out through the three 10-in. outlets of the dome after it had cooled.

What's New in

Equipment and Accessories

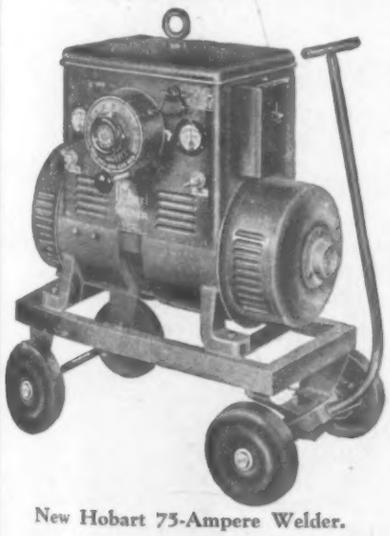
New 75-Ampere Generator for Light-Gauge Welding

A new 75-ampere arc welder, just announced by Hobart Bros. Co., Box 4135, Troy, Ohio, is said to be the result of two years' experimental and practical development. The manufacturers point out that it embodies practically the same design and construction as their larger models—adhering to the same principles and including the same equipment.

Rated at 75 amperes, 25 volts, being designed especially for light-gauge welding, it has a welding range of 15 to 125 amperes in three steps, and performs exceptionally well on 24 gauge and heavier, using 1/16, 5/32 or 1/8-in. electrodes, either bare or coated. It is powered by a 3-hp. electric motor.

It comes completely equipped with starting switch, polarity-change switch, dual remote control, double-reading voltmeter and double-reading ammeter. It is provided with a convenient lifting eye on top, and in the portable type is bolted to a sturdy, welded steel truck with four steel disc wheels and drawbar. It is easily demountable from the truck when desired, the reactance unit being enclosed in the pressed steel "turret top."

The volt-ampere curve of this machine is said to approach the vertical far more



New Hobart 75-Ampere Welder.

nearly than in the case of the larger machines, since it is especially intended for low current values. Moreover, it is claimed that the arc is extremely tenacious, even down to the very minimum current with which it is practicable to weld.

The machine is of arc-welded steel construction throughout, and there has been no skimping in all-important copper and electrical sheet, both the welding generator and the inbuilt exciter being of ample size and with ample brush capacity. The motor is also of rugged design, with arc-welded rotor bars and with the stator ground concentric with the bearings to insure a uniform air gap.

Motor, generator and exciter, with a special cooling fan, are carried on a single, heavy-duty, horizontal shaft with ball bearings mounted at the ends, just as in the larger Hobart models. Its rated speed, 1,750 r.p.m., is said to result in economy and long life.

New Electrode Holder Rated at 500-600 Amperes

The K-5 Craftsweld electrode holder, illustrated and described in the December, 1933, issue of *The Welding Engineer*, is now available in a larger capacity, rated at 500-600 amperes, with an electrode capacity up to 3/8-in. diameter, according to an announcement from the Craftsweld Equipment Corp., 250 West 54th St., New York, N. Y. This new holder, known as K-10, weighs only 21 ounces, and in it are retained all the features of construction of the K-5 holder.

Non-Crystalline Copper for Use in Paints

Reducing copper to a non-crystalline form suitable for use in a liquid vehicle and giving in effect the equivalent of liquid copper, is made possible through the discovery of a new chemical process by H. M. Rice, metallurgist and manager of the Nichols Copper Co., Chicago, Ill., a unit of the Phelps Dodge Corp., it is announced.

The metal, 98.3% pure, can now be applied in this liquid form, Mr. Rice reports, to create a virtual sheath or armor of copper upon almost any surface. The new product is not to be confused with the common copper oxides or bronze powders, Mr. Rice points out.

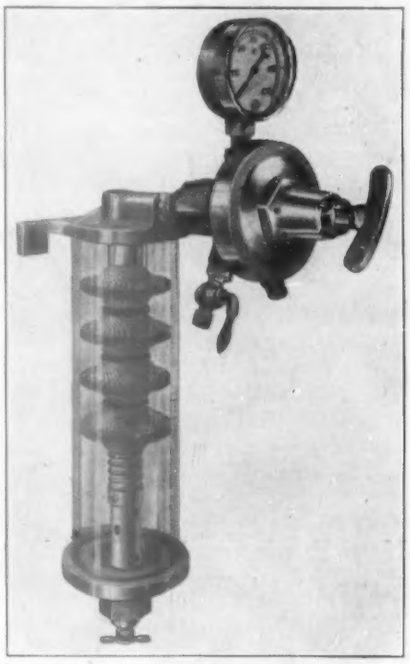
By virtue of the shapeless form of the tiny copper particles, which are so small that they penetrate a 350-mesh screen, no minute gaps are left in the coating after application by spraying, dipping or by a brush, it is said. The copper remains in suspension in the special vehicle which has been developed, assuming an approach to a semi-colloidal state.

Laboratory and field tests indicate that the product should have a useful life of five to ten years and longer, it is reported. It is also said to be highly resistant to acid and other forms of corrosion. The National Copper Paint Co., 666 Lake Shore Drive, Chicago, has been formed to promote the use and sale of the new product.

Milburn Announces a New Gas and Air Purifier

A unique, practical purifier for conditioning air or gas has just been announced by the Alexander Milburn Co., 1403 W. Baltimore St., Baltimore, Md.

This purifier is radical in design, having a glass shell through which any accumulated oil, moisture or dirt can be



Moisture or Dirt Accumulates in the Glass Shell.

readily seen, enabling the user to quickly determine when cleaning is necessary. A series of perforated plates and strainers efficiently remove foreign substances from air or gas lines, ensuring at all times a clean, moisture-free flow for paint spraying, welding or any other similar operations.

This purifier has very few parts and can quickly and easily be disassembled for cleaning. It is equipped with a full-size 3-in. diaphragm regulator having a graduated gauge.

Welding Electrode Produces Self-Hardening Deposit

A new hard-surfacing electrode, designed for building up ordinary carbon steel, low-alloy or high-manganese steel surfaces to resist abrasion, is announced by The Lincoln Electric Co., Cleveland, Ohio.

This new electrode, known as "Abraso-

weld," will be found of particular value in such applications as restoring the teeth, lips and bottoms of power shovels; lugs and treads of tractors; housings and impellers of centrifugal sand pumps; rock-crushing equipment; agricultural machinery; and gear and pinion teeth.

"Abrasoweld" electrode is said to provide a deposit of abrasion-resisting alloy of the self-hardening type which surface-hardens very rapidly under impact and abrasion and does not tend to chip off in service. It develops its maximum hardness only at the surface where it is cold worked, thus leaving a strong, tough core for resisting shock. In this respect, the "Abrasoweld" deposit is comparable to high-manganese steel, the difference being that "Abrasoweld" metal is harder as deposited and increases in hardness much more rapidly, it is pointed out. For example, moderate peening will increase hardness as deposited from 20-30 Rockwell C to approximately 50 Rockwell C. Weld metal produced by "Abrasoweld" must be ground to shape, as it cannot be filed or machined.

The "Abrasoweld" deposit is also said to resist corrosion to a considerable degree, and the deposit can be forged hot without materially altering its physical properties.

"Abrasoweld" electrode is made in 3/16-in. size, 14 in. in length. It is used with reversed polarity, a current range of 125-200 amperes and 24-27 arc volts.

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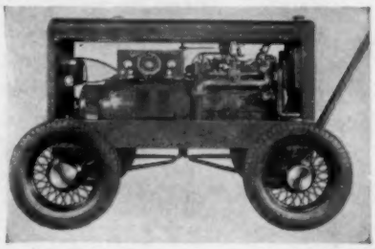
Startix equipment, with automatic choke and downdraft carburetor, is an outstanding advantage never before available with arc-welding equipment. This eliminates the delay, fatigue and danger incident to hand cranking, and makes it unnecessary even so much as to press a starting lever or pull a choke wire. The Startix goes into operation as soon as the ignition switch is turned on and automatically cuts out the instant the engine starts. The automatic choke, thermostatically controlled, insures quick starting, without danger of flooding, in all kinds of weather.

Calibrated ignition, with vacuum-controlled distributor, insures high economy with freedom from "ping" when using ordinary commercial gasoline. A special generator supplies ample current to keep the storage battery charged, even when it is used for lights on the job. Air, oil and gas filters are standard equipment. Test results are cited to show improved economy, even with the increased power of the engine, due to the strictly modern design of these Chrysler Industrial engines—with special attention paid to cooling so that all cylinders are equally and efficiently cooled.

The 200- and 300-ampere sizes are equipped with a 6-cylinder engine, while the 400-ampere size is equipped with a heavy-duty, 8-cylinder industrial engine. Variable-speed adjustment makes it possible for the operator to select the most suitable and economical engine speed for each job, at any point from 1,000 to 1,800 r.p.m., full rated capacity being available at 1,500 r.p.m. All three sizes embody the special features mentioned.



Welder Equipped With Chrysler Motor.

All models may be had in stationary form or portable, with shop-type or yard-type steel wheels, or may be mounted on the Hobart road trailer with wire wheels, pneumatic tires, radius rods and stabilizer.

"Staid-Arc" Welders Can Now Be Had With Gas Drive

Universal "Staid-Arc" welders, described in the March issue of *The Welding Engineer*, are now available in the gasoline-engine-driven types, both portable and stationary, according to an announcement by the Universal Power Corp., 1718 Clarkstone Road, Cleveland, Ohio, who manufacture these welders.

The engines are of the 6-cylinder Chrysler Industrial type, vibration-free construction, equipped with either battery ignition and electric starting equipment or with magneto ignition and hand cranking. The engines are said to have ample reserve power. Large-capacity, non-corrosive gasoline tanks are standard equipment. Air cleaners and efficient carburetion make for reliability and low gas consumption. Engine features include heavy-duty crankshafts, sistant alloy valves and valve-seat inserts. An idling device can be furnished as optional equipment. The portable gear can be provided with any of several types of wheels, and springs may be had on any model.

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the properties of zinc-dust paint when used as a primer and finishing coat for iron, steel and galvanized surfaces.

The design of modern industrial piping systems is discussed in a pamphlet issued by Tube-Turns, Inc., 805 South 5th St., Louisville, Ky. Of particular interest is the method illustrated for determining the most economical pipe sizes and the amount of frictional resistance in straight pipe and bends. Charts are drawn up to assist in making calculations.

The use of molybdenum as an inhibitor of chromium-carbide precipitation in 18-8 stainless steel, is discussed in the March, 1935, issue of "The Moly Matrix," issued by the Climax Molybdenum Co., 500 Fifth Ave., New York, N. Y. The test results cited show an absence of "weld decay" when welding 18-8 steel containing this element.

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Airco Show Crew Puts on Demonstrations

Using their welding and cutting equipment and metal-spraying equipment, the Air Reduction Sales Co. are promoting a series of welding and cutting shows throughout the Eastern and Central states. These are being held in shops and plants that are users of these processes and who have space facilities to accommodate the large audiences.

The show crew has been on the road for quite some time, having completed showings in the company's Metropolitan, Philadelphia and Pittsburgh districts during the latter part of 1934.

Their itinerary for this year, starting February 4th, has consisted of visits of one week each to the following districts: Charlotte, N. C.; Birmingham, Ala.; New Orleans, La.; Shreveport, La.; Oklahoma City, Okla.; Kansas City, Mo.; St. Louis, Mo.; Louisville, Ky.; Wheeling, W. Va., and two weeks in the Texas districts.

The truck is scheduled to be in the Bettendorf, Iowa, district the week beginning April 29th; in the Milwaukee district beginning May 6th; in the Chicago district during the next week, and in the Detroit district the week following.

The schedule during the first and second weeks of May is as follows:

Milwaukee District:
- Green Bay, Wis., Jules Peters Transport & Storage, May 6th.
- Sheboygan, Wis., Optenburg Iron Works, May 7th.
- Racine, Wis., Surf Ballroom, May 8th.
- Milwaukee, Wis., Mack International Corp., May 9th and 10th.

Chicago District:
- Rockford Ill., Olsen Welding Co., 203 Morgan St., May 13th.
- Chicago, Ill., May 14th and 15th. (One day's demonstration will be held on the north side of the city and one on the south side. Announcement not yet made as to locations.)
- South Bend, Ind., Bendix Products, May 16th.
- Fort Wayne, Ind., Wayne Welding & Supply Co., May 17th.

Demonstrations include the piercing of steel blocks by the oxygen lance, cutting of irregular shapes and heavy steel sections by oxyacetylene machines, pipe beveling with the machine torch, Aircowelding of pipe, cutting and testing weld coupons, Aircobrazing of Walseal fittings, rivet cutting by torch, metal spraying, and arc welding.

An average of more than 375 have been attending these demonstrations. The public is admitted without charge.

Michigan Gases, Inc., Hold Second Successful Clinic

At the second annual welding clinic held by Michigan Gases, Inc., in Grand Rapids, Mich., on March 27th to 29th, the registration numbered 594, and the interest exceeded that of last year's successful clinic. Again this year, as last, Dutch-costumed girls served cookies and coffee, these being prepared with propane fuel gas, furnished by the company. Posters on the walls of the clinic room gave the following interesting history of the company:

1919—Established under the name of Grand Rapids Welding Supply Co. The first company of its kind in Michigan outside of Detroit. Only one employee, giving but part of his time, cared for the first year of business.

1922—Built the first acetylene-compressing plant for the welding trade in the state outside of Detroit.

1925—Continued increase of business caused the business to be incorporated, with paid-in capital stock of $42,000. Built the first oxygen plant in Grand Rapids. Opened the Kalamazoo branch. Eight full-time employees.

1929—Built the second bulk propane station in Michigan. Eighteen full-time employees were now needed to care for the growing business.

1934—Opened Lansing branch. The number of employees has steadily increased, and now it is 30.

1935—Up to March 1st, number of employees had increased to 34.

W. E. Van Dreser has been appointed manager of the welding-wire division of the Central Steel & Wire Co., Chicago, Ill. Mr. Van Dreser was formerly direct factory representative in Milwaukee, Wis., for the Hollup Corp., handling wire sales in Wisconsin and Minnesota, and during an interval of two years he was in charge of the Hollup wire plant at Bush Terminal, Brooklyn, and in charge of sales in the East, with headquarters in New York. From 1918 to 1926 he served as district manager in Minneapolis, Minn., for The Lincoln Electric Co.

E. F. Price, a pioneer in the acetylene industry, died on April 15th at his estate at Port Chester, N. Y. He was associated with the Willson Aluminum Co., of Spray, N. C., at the time when the company, experimenting with an electric furnace, produced a gas that was later called acetylene. Afterwards he became president of the Electro Metallurgical Co. and then vice-president of the Union Carbide & Carbon Corp., from which he retired in 1925.

Walter E. Barnes has been appointed assistant to F. H. Gordon, vice-president in charge of sales of the Lukens Steel Co., Coatesville, Pa. Mr. Barnes has been with the Lukens organization since 1910.

The New York district sales office of the Republic Steel Corp. will be moved to the Chrysler Building, on May 1st.

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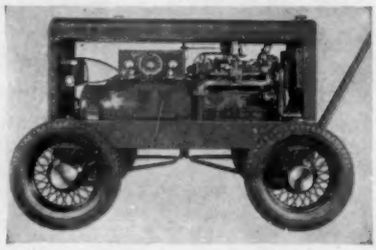

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- South Bend, Ind., Bendix Products, May 16th.
- Fort Wayne, Ind., Wayne Welding & Supply Co., May 17th.

Demonstrations include the piercing of steel blocks by the oxygen lance, cutting of irregular shapes and heavy steel sections by oxyacetylene machines, pipe beveling with the machine torch, Aircowelding of pipe, cutting and testing weld coupons, Aircobrazing of Walseal fittings, rivet cutting by torch, metal spraying, and arc welding.

An average of more than 375 have been attending these demonstrations. The public is admitted without charge.

Michigan Gases, Inc., Hold Second Successful Clinic

At the second annual welding clinic held by Michigan Gases, Inc., in Grand Rapids, Mich., on March 27th to 29th, the registration numbered 594, and the interest exceeded that of last year's successful clinic. Again this year, as last, Dutch-costumed girls served cookies and coffee, these being prepared with propane fuel gas, furnished by the company. Posters on the walls of the clinic room gave the following interesting history of the company:

1919—Established under the name of Grand Rapids Welding Supply Co. The first company of its kind in Michigan outside of Detroit. Only one employee, giving but part of his time, cared for the first year of business.

1922—Built the first acetylene-compressing plant for the welding trade in the state outside of Detroit.

1925—Continued increase of business caused the business to be incorporated, with paid-in capital stock of $42,000. Built the first oxygen plant in Grand Rapids. Opened the Kalamazoo branch. Eight full-time employees.

1929—Built the second bulk propane station in Michigan. Eighteen full-time employees were now needed to care for the growing business.

1934—Opened Lansing branch. The number of employees has steadily increased, and now it is 30.

1935—Up to March 1st, number of employees had increased to 34.

W. E. Van Dreser has been appointed manager of the welding-wire division of the Central Steel & Wire Co., Chicago, Ill. Mr. Van Dreser was formerly direct factory representative in Milwaukee, Wis., for the Hollup Corp., handling wire sales in Wisconsin and Minnesota, and during an interval of two years he was in charge of the Hollup wire plant at Bush Terminal, Brooklyn, and in charge of sales in the East, with headquarters in New York. From 1918 to 1926 he served as district manager in Minneapolis, Minn., for The Lincoln Electric Co.

E. F. Price, a pioneer in the acetylene industry, died on April 15th at his estate at Port Chester, N. Y. He was associated with the Willson Aluminum Co., of Spray, N. C., at the time when the company, experimenting with an electric furnace, produced a gas that was later called 'acetylene. Afterwards he became president of the Electro Metallurgical Co. and then vice-president of the Union Carbide & Carbon Corp., from which he retired in 1925.

Walter E. Barnes has been appointed assistant to F. H. Gordon, vice-president in charge of sales of the Lukens Steel Co., Coatesville, Pa. Mr. Barnes has been with the Lukens organization since 1910.

The New York district sales office of the Republic Steel Corp. will be moved to the Chrysler Building, on May 1st.

W. H. Oliver will continue in charge as sales manager. The company's export department, under the direction of D. H. Bellamore, will also occupy a portion of Republic's new suite of offices.

James C. Ogden is the new president of the Robert W. Hunt Co., Chicago, succeeding C. B. Nolte, who has resigned to accept the presidency of the Crane Co. Mr. Ogden was formerly vice-president in charge of the company's Eastern and foreign activities at New York, and has been an executive of the company for the past 35 years.

R. W. Pursel, well known in the welding fraternity in and around Indianapolis, Ind., who was for some time connected with the welding department of the Indianapolis Power & Light Co. and was welding instructor in the Y. M. C. A. welding school, has accepted a position as service engineer with the Steel Sales Corp., of Chicago.

Harry Ewert has been appointed by the Harnischfeger Corp., Milwaukee, Wis., as assistant sales manager of the Welder Division. For the past ten years Mr. Ewert has been identified with the production and sales of P&H-Hansen welders, during which time he was closely associated with the inventor, K. L. Hansen.

The General Welding & Equipment Co. have moved to new quarters at 28 Carlton St., Cambridge, Mass. Carlos Krebs, son of the late Dr. Krebs, founder of the company, has been elected president, succeeding Thomas F. Stoddard. Richard B. Cross has been elected a director and general manager of the company.

The Bingrod Co., Cassapolis, Mich., recently appointed the W. J. Holliday Co., of Indianapolis, Weldit Acetylene Co., of Detroit, and Suelf & Siefeld, of Milwaukee, as distributors of "Bingrod." This makes a total of 24 distributors now handling this product. "Bingrod" is now being produced in 1/8 and 1/4 in. diameters.

The Seattle, Wash., district sales office of the Republic Steel Corp. was recently moved to the White-Henry-Stuart building. C. D. Winter continues in charge of the office as district sales manager, assisted by his present staff, to which is being added Archie Rider, recently transferred from the Youngstown office.

Roy M. Dutton, for the past several years California representative for the Smith Welding Equipment Corp., died suddenly on March 24th. Mr. Dutton, who at one time was connected with the Stoody Co., was widely known in the welding industry on the Pacific Coast.

The Sight Feed Generator Co., Richmond, Ind., has entered into an arrangement with the All-Weld Co., of Toronto, Canada, whereby the latter serves as Canadian distributor of Sight-Feed equipment. A stock will be kept on hand in Toronto.

The Federal Machine & Welder Co. has moved its Chicago office from 15 S. Clinton St. to the Madison Terminal Building at 9 S. Clinton St. Stanley Mazurek, Jr., continues as office manager, with C. O. Watson as assistant.

"Enduro" stainless steel is now being handled by the Gilmore Steel & Supply Co., 825 Folsom St., San Francisco, Calif.

Notes From the Field

A crankshaft measuring 8 ft. 6 in. long, with a diameter of 7 1/8 in. and weighing approximately 2 tons, was recently repaired by the Superior Welding Co., 331 Knoxville Ave., Peoria, Ill., and when finished it was within 0.0005 in. of being perfect. It had two throws broken, and about 75 lb. of shielded-arc electrode was require to weld it. From the beginning of the job, shop owners and foremen of machine shops came to watch the progress and results, as this was the first repair of this kind to be welded in that vicinity, it is reported. The crankshaft is used at the pumping station of the Liverpool, Ill., drainage district.

L. B. Thomas, operating the Economy Welding Co., Cuming and 17th Sts., Omaha, Nebr., has just completed the welding on five steel bridges constructed by the Nebraska Highway Commission on what is known as the West Dodge St. Project. He used a portable arc-welding unit. Since Jan. 1st, this company has been engaged in rebuilding the steel trailers used in trucking automobiles from the factories in the East to Omaha. These trailers were lengthened so three Fords of the 1935 model can be transported at one tme.

The Blanchette Welding Co., Denver, Colo., recently sent Jerry Auhl, with his helper, on a company truck to the scene of the Metals Tunnel Co. cperations near Idaho Springs to repair a broken crankshaft in the main power plant of the mine. Two days were consumed on the job but officers of the mine expressed their thankfulness for so slight a delay; repairing instead of ordering a new part saved them many days of operation and many hundreds of dollars, they stated.

A 20-in. water line to supply the water needs of Shawnee, Okla., was recently laid by the B. & M. Construction Co., of Oklahoma City, using the Lindeweld process with a 3-flame torch. An average of 23 welds per day per welder was made. The same welding process was also used on a line recently completed by the O. B. & L. Construction Co., running from Madill to Ada, Okla., and on an 18-mile line from Ada to Francis.

A large tuna-fishing boat, in which much welding is being employed, is being built by the Campbell Machine Works, San Diego, Calif. This craft, it is said, will carry the largest supply of fuel of any boat of its type ever built. The Shockey Boiler Works, of San Diego, has the contract for the fabricating and installation of the fuel-oil tanks (five in number and all-welded) having a total capacity of 35,000 gallons.

The Iverson Tool Co., with headquarters in Tulsa, Okla., who operate a chain of oil-field machine and heavy blacksmithing shops, recently installed a welding department completely equipped with arc and gas welding and cutting equipment. The new department is under the supervision of Edward Miller at Wink, Texas. This is the first welding installation this company has made in any of their eight shops.

Wm. Joor, welding-shop operator, of 4380 East 9th St., Los Angeles, Calif., has made extensive changes in the arrangement of his shop and equipment. The office has been moved to the rear of the shop, and the shop equipment to the front. The change adds convenience and light for the shop work. In his spare time, Mr. Joor recently built a livestock trailer, much of which is of welded construction.

Carl Randecker, for some time foreman of the Weber Machine Shop, Kearney, Nebr., has purchased an arc-welding machine and opened his own shop in Lexington, Nebr. He is also equipped for oxyacetylene work.

The Brauer Machine & Supply Co., Oklahoma City, Okla., have sold their

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MELTING POINTS OF ANACONDA WELDING RODS

Material	Approximate Melting Point Degrees	
	Cent.	Fahr.
Tobin Bronze	885	1625
Manganese Bronze	870	1598
Brazing Metal	930	1706
Economy Bronze	885	1625
Everdur	1019	1866
Anaconda 520	885	1625
Phosphor Bronze A	1050	1922
Phosphor Bronze E	1070	1958
Phosphor Bronze D	1000	1830
Phosphor Bronze C	1025	1877
Silicon Copper	1083	1981
Deoxidized Copper	1083	1981
Electrolytic Copper	1083	1981
Nickel Silver	1055	1931
Ambrac	1150	2102

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ANACONDA WELDING RODS

Odessa, Texas, shop to G. W. Miether, formerly manager of the company's branch office at Houston, Texas. This shop is reported to be handling heavier work than any other shop in western Texas, and specializes in building portable rotary draw works.

Work has started on welding the heating system in the new Roosevelt School building in Moline, Ill., the contract for this work having been awarded the Moline Welding Service, of which A. R. Gustafson is proprietor. Oxyacetylene welding is being used. The pipe ranges in size from 1½ to 8 in., and welding neck flanges and Tube-Turns are being employed.

The Southwest Welding & Manufacturing Co. plans to spend $40,000 in the near future for additions to its plant on Mission Road, Alhambra, Calif. An extension will be built to the open end of the boiler shop, doubling the capacity of this part of the plant, according to J. W. Lucas, general manager. It is planned later to enlarge the main plant.

The Capistrano Repair & Welding Shop is adding new equipment to its service shop in San Juan Capistrano, Calif. A new lathe was recently installed, which also necessitated a complete rearrangement of shafts, pulleys, etc. The concern is also starting construction of a portable electric welding unit for use in field and shop work.

M. A. Buchanan has opened a new job welding shop at 2906 Cherry Ave., Long Beach, Calif., featuring general oil-field welding service. Mr. Buchanan has been in the welding field for over 11 years, and was formerly associated with "Tex" Hurd's Welding Works. His shop will be operated under the name of Buck's Welding Works.

The Industrial Welding Works, recently organized in San Fernando, Calif., and until recently operated at 714 San Fernando Road, has been moved to 216 S. Maclay St. C. S. King and R. T. Bivins are joint partners in ownership and operation of the shop. Mr. King has been in the welding industry for over sixteen years.

The Western Pipe & Steel Corp., Los Angeles, Calif., has been awarded a contract for the fabrication of several thousand feet of all-welded ventilating pipe to be used in connection with tunnel construction on the Mono Basin project of the Los Angeles Water and Power Department.

A stress-relieving oven has been installed in the Alhambra, Calif., plant of C. F. Braun & Co. for meeting the requirements of the A. S. M. E. and A. P. I.-A. S. M. E. Codes in the fabrication of welded absorption towers, stills, fractionating columns, and other pressure vessels. The James H. Knapp Co., of Los Angeles, collaborated in the design and installation of the oven.

The Solana Iron Works, Solana Beach, Calif., has added much business recently through the addition of electric welding to its shop facilities. A 250-ampere portable machine has proved quite practical in the work of the shop, in which is featured ornamental iron, general welding and repair work. L. A. Lank and C. Baker are the owners.

The Hardwick Construction Co., of Memphis, Tenn., has received a large contract on the North Platte, Nebr., hydro-power project, sponsored by the government, which will require considerable welding. For this purpose, the company has bought a 300-ampere welder from Fuchs' Equipment Co., of Omaha, Nebr.

A new shop featuring both acetylene and electric welding recently opened for business in the Signal Hill (Calif.) oil field at 3201 N. Cherry. E. G. Meyers is owner and manager of the new shop, which is to be known as the Meyers Core Drilling & Bit Service Shop. An electric welder was recently added to the shop's equipment.

A large amount of welding is being done by the U. S. Navy at the Destroyer Base in San Diego, Calif., in repair work on the floating dry-dock designated as the "A-R-D-1," which was recently brought to San Diego from the Atlantic coast. The work comprises much plate work and reinforcing.

The Campbell Machine Co., of San Diego, Calif., is adding a new welding shop to its ship-building and repair plant at the foot of Eighth St. The building is approximately 30x40 ft. and is of welded steel frame covered with corrugated iron. Wm. Kairot is in charge of welding.

Martin ("Red") Schuerman, owner of the F. & S. Welding & Machine Works, 5100 East 60th St., Maywood, Calif., died recently from heart disease. The shop will continue to be operated under the old name, and will be managed by A. Dageforde, a brother-in-law of Mr. Schuerman.

The Pioneer Blacksmith & Welding Shop, 702 Celis St., San Fernando, Calif., has modernized its welding department by adding electric welding equipment. A new 200-ampere motor-driven welding unit was recently installed in the shop, which is owned and operated by T. A. Skaug.

J. F. Beevers, formerly with the Williamson Garage, Sante Fe, N. M., has opened a new shop under the name of the Sante Fe Welding Co. at 318 Water St., Sante Fe. He moved to the present location after operating temporarily as a department of the Sante Fe Wrecking Co.

The Omaha Branch of the York-Allen Ice Machine Co. has just bought a 300-ampere welder, which will be used in welding brine pipes for the refrigerating outfits installed in the Omaha territory. Heretofore the York-Allen company let this work out on contract.

A contract for the electric welding of 88 miles of 10-inch pipe for the General Pipe Line Co., from Lebec to Torrance, Calif., has been awarded H. C. Price, Inc., Los Angeles, Calif. The general contractors are Macco Robertson and Land Transportation Co.

The Schultz Machine Co., featuring welding and general repair work, recently opened for business at 1111 N. Alameda, in Compton, Calif. Frank Schultz, owner, was formerly associated with the Shaffer Oil Tool Co., in the Southern California oil fields.

George Bamber, of Bamber & Co., Long Beach, Calif., was killed recently in an automobile accident. Mr. Bamber was well known in the Southern California oil fields, having operated welding shops in various fields during their early development.

The Cockrum Welding Works, of 40 W. Avenue 26, Los Angeles, Calif., is building and installing a set of steel rolls to be used in the building of tanks of all kinds. These rolls are somewhat unusual in design and construction, and will be all-welded.

A 6-inch gasoline pipeline, 120 miles long, from Enid, Okla., to Hutchinson, Kan., is to be electric welded by H. C. Price, Inc., Bartlesville, Okla., for the Cimarron Valley Pipe Line Co. The B. & M. Construction Co. are the general contractors.

W. C. Steadman, formerly associated with the Standard Steel Works, is erecting a new plant at 54th St. and Pacific Blvd., in Huntington Park, Calif., where he will open a welding shop under the name "Pacific Welding Works."

L. E. Hinds, owner of the Industrial Welding & Iron Co., of Los Angeles, Calif., has moved his equipment and

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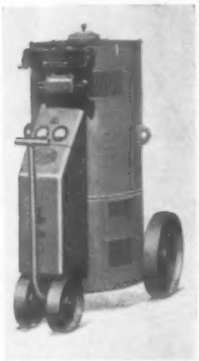

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This new Willson goggle is for use on jobs where welding, brazing, burning or cutting is interrupted frequently to permit inspection or grinding, flattening and forming work. Much time is saved by simply flipping up the hinged frames which hold the 50 mm. Willson-Weld lenses in place. In the cups under the filter lenses are 50 mm. Super-Tough lenses for protection from flying particles, etc. DC50 is comfortable, well ventilated and can be worn over spectacles when necessary.

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Prices f. o. b. shipping point

Style DC50 Goggle, $4.50 each
No. 20 Welding Helmet $9.90 each

WILLSON PRODUCTS, Inc.
Reading, Pa.

opened a new shop at 1172 E. Slauson Ave. He was formerly located at 5711 S. Central.

A welding shop, machine shop, and a number of large warehouses are included in a building program of the U. S. Forestry Service Department. These improvements will be erected near Pasadena, Calif., in the Arroyo Seco.

The Finkelstein Foundry & Supply Co., of 2323 East 23rd St., Los Angeles, Calif., recently added electric welding to its plant equipment. A new 400-ampere Lincoln welding unit is the first electric welder to be installed.

A. J. Seek recently opened a welding shop at 513 N. W. Second St., Oklahoma City, Okla., known as The Weldery, which is equipped for repair and production welding by both the electric and oxyacetylene processes.

Reports from the new Ada, Okla., oil field are to the effect that drilling activity is holding up. A number of gathering lines and other short pipelines are under construction. Various shops report a good business.

S. B. Ramsey has opened a branch shop of the Ramsey Boiler Works at Andrews, Texas, in a new oil field. This shop is equipped to do welding. The main shop of the company is at McCamey, Texas.

L. S. McDonald, of Compton, Calif., has opened a welding service with headquarters at 11739 S. Second Ave. He recently purchased a 400-ampere portable gas-electric welding unit.

Robert E. Brown, a welder with 16 years' experience has opened a job welding shop at 816 Fourth St., Portsmouth, Ohio, equipped with a portable arc welder and gas-welding equipment.

The Nebraska Master Welders Association is now functioning. "Heine" Schneiderwind, president of the Omaha Welding Co., is president, and Jack Reed is secretary and treasurer.

The Spengler Tool Co., who manufacture and service oil-field drilling tools, which necessitate considerable welding, has moved from Oklahoma City, Okla., to Kansas City, Mo.

The Le Tourneau Co., manufacturers of welded road equipment, recently started the building of a new factory in Peoria, Ill.

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Fly Ball Governors—Adapted to all makes of auto engines; belt driven, flat or V. Price, $6.50 prepaid. Satisfaction guaranteed. In ordering state style of belt. Wm. D. Alber, Beatrice, Nebr.

Bargains—Demonstrator Arc Welders. Gasoline and electric drive. 30 days' trial. Easy terms if desired. Write Ken's Exchange, Box U-451, Troy, Ohio.

HELP WANTED

Salesmen Wanted—Nationally known manufacturer of oxyacetylene equipment desires salesmen for territories in South and Central West. Salary and expense basis. Give experience in detail, age and references. Address Ap-4, The Welding Engineer.

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Size 2x4½" @ $2.40 per dozen.

Size 45 to 50 M.M., inclusive @ 35c per pair.

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Reward—For address Lowell G. Arnold, Welder, formerly employed Curtis Aircraft. Also worked Las Vegas, Nevada, San Diego, California. Wire collect E. L. McCoubrey, 204 Petroleum Securities Bldg., Los Angeles, California.

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Can You Use Me?—Would like an interview with someone looking for a man with wide experience and a good reputation in the welding industry. Widely acquainted; has traveled as serviceman in sales promotion work and direct sales. Also experienced as demonstrator, and as a thoroughly qualified contact man. Background of practical experience as well as theoretical knowledge. Honest, temperate; have had exceptional success in dealing with difficult situations. A-1 references. Address Ap-3, The Welding Engineer.

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Reliable Arc and Acetylene Welder—34 years old. With sales experience. Wishes permanent position with large concern. Able to take charge of any kind of welding. Twelve years' experience. References. Martin Steinicke, Cushing, Ia.

Combination Welder and Supervisor—11 years' experience in arc and gas welding on all kinds of metals. Five years as supervisor. Will go any place for steady position. C. L. Berry, 6612 Vine St., Cincinnati, Ohio.

Welder—20 years' general experience, including machine cutting. An A-1 welder on pipe. Responsible, honest and trustworthy, and can furnish the finest of references. Address Ap-2, The Welding Engineer.

All-Round Gas Welder—4 years on pipeline work, 6 years in Government shop on all metals. Age 28, married. A-1 references. H. V. Webb, 1225 Ft. Stockton Drive, San Diego, Calif.